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WORLDWIDE ROBOTICS SURVEY AND DIRECTORY

ROBOTIC INDUSTRIES ASSOCIATION

DEARBORN, MI 48121

1983 Worldwide Robotics Survey and Directory

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Material published in this survey and directory is derived from submissions by organizations listed as respondents (see table of contents). RIA assumes no liability for any incorrect information which may be contained herein.

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Introduction

Objectives of the Worldwide Robotics Survey and Directory

This publication is intended to provide the reader with a general summary of the robotics industry on a worldwide scope. The data has been collected from individuals considered official expert spokespersons within each country. Not all data from each country is all-inclusive and we recommend contacting those on the respondents' list (see page 77) for further details.

Data Collecting Procedures

The data in the survey reflects end of 1983 statistics. The definition used for "robot" is as follows:

> "A robot is a reprogrammable, multifunctional manipulator designed to move material, parts, tools, or specialized devices, through variable programmed motions for the performance of a variety of tasks."

What is the Robotic Industries Association (RIA)?

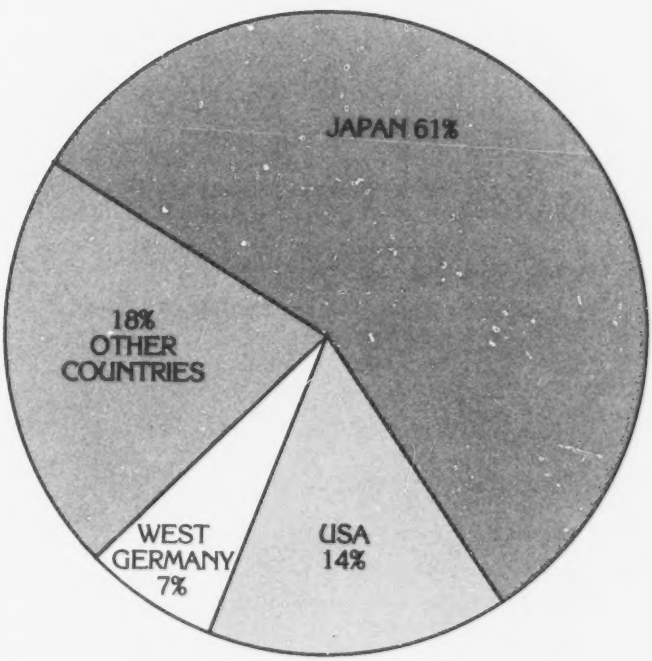
Founded in 1974, Robotic Industries Association (RIA) is the only trade association in North America organized specifically to serve the field of robotics. Headquartered in Dearborn, Michigan, RIA represents more than 330 company members including leading U.S. robot manufacturers, distributors, accessory equipment and systems suppliers, corporate users, research organizations, consultants, and contract service companies.

The primary purpose of RIA is to promote the use and public acceptance of robotics and automation. Major RIA activities designed to accomplish this goal include the sponsorship of the national robots show held annually in the midwest, regional robot expositions such as ROBOTS WEST, ROBOTS EAST, and trade-related workshops and seminars. RIA also collects and reports industry statistics, formulates standards and guidelines, publishes and distributes books, produces films and videotapes, and lobbies for legislation to stimulate the use of robots.

RIA formed two associations in 1984: Automated Vision Association (AVA)—to promote the use of machine vision technology, and National Personal Robot Association (NPRA)—to serve the needs of companies and individuals interested in personal robotics.

WORLDWIDE ROBOTICS SURVEY RESULTS

World Robot Population
(by percentage)



Total Population of Robots By Application (End of 1983)

	Spot Welding	Arc Welding	Painting/ Coating	Finishing	Assembly	Loading/ Unloading	Material Handling	Casting	Other	TOTAL
JAPAN	5806	6036	1456	....	10737	3690	10217	1039	2284	41265
USA	2269	1002	265	203	1525	783	--2466--		887	9400
WEST GERMANY	1560	856	586	22	248	320	194	132	882	4800
FRANCE	560	251	147	45	140		-- 694 --		173	2010
ITALY	--700--		--200--		200	500	--400--			2000
SWEDEN										1900
CZECHOSLOVAKIA	25	22	62	120	38	258	800	225	295	1845
UNITED KINGDOM	349	234	167	27	103	165	412	52	244	1753
CANADA	320	72	71	32	20	75	70		40	1753
AUSTRALIA	50	125	10			287**			56	528
BELGIUM	240	45	19	5	4	60	13	2	126	514
POLAND	....	42	20	66	29		54	7	27	245
NETHERLANDS	36	61	36	11	7	--45--		....	17	213
SWITZERLAND	2	8	8	10	20	20	35	5	2	110
DENMARK	0	12	13	0	12	8		24	7	76
									World Total	67,359

** Includes finishing, loading and unloading, and casting applications.

Total Population of Robots By Application (End of 1983)

Robot Population—By Robot Type (As of 12/83)

	Robot Populations (units)—By Robot Type (as of 12/83)				Total Monetary Value* (as of 12/83)			
	A	B	C	TOTAL	A	B	C	TOTAL
JAPAN	29,113		17,644	46,757	$1.27 billion		$332,500,000	$1.57 billion
USA	1,596	5,492	2,312	9,400	$118,263,600	$406,957,200	$171,319,200	$696,540,000
FRANCE	720	1,290	Not Included	2,010	$ 60,360,000	$ 69,520,000	Not Included	$129,880,000
ITALY	600	600	800	2,000	$ 45,000,000	$ 35,000,000	$ 25,000,000	$105,000,000
CZECHOSLOVAKIA	85	160	1,600	1,845	$ 51,000,000	$ 22,000,000	$ 32,000,000	$105,000,000
BELGIUM	115	283	116	514	$ 7,200,000	$ 15,400,000	$ 2,500,000	$ 25,000,000
POLAND	65	120	60	245	$ 2,600,000	$ 1,200,000	NA	$ 3,800,000
SWITZERLAND	90	20	---	110	$ 4,500,000	$ 700,000	---	$ 5,200,000
DENMARK	42	13	21	76	$ 2,100,000	$ 520,000	$ 420,000	$ 3,040,000

A · Reprogrammable, servo-controlled continuous path
B · Reprogrammable, servo-controlled point-to-point
C · Reprogrammable, non-servo controlled point-to-point

* · In 1983 U.S. dollars

Robot Population—By Robot Type (As of 12/83)

Robot Standards Activities

The countries mentioned in this section have designated that standards activities are currently underway.

Working on Standards	*Established Standards*
Australia	No
Czechoslovakia	No
Denmark	No
France	Yes - see below
Japan	Yes - see below
United States	Yes - see below
West Germany	No

Japan

In addition to establishing standards, Japan has generated much information on this subject matter. The following is a list of Japanese national standards:

JIS B 0134-1979	Glossary of Terms for Industrial Robots
JIS B 0138-1980	Symbols for Industrial Robots
JIS B 5431-1981	Standard form for Indicating Characteristics and Function of Industrial Robots
JIS B 8432-1983	Measuring Methods for Characteristics and Functions of Industrial Robots
JIS B 8433-1983	General Code for Safety of Industrial Robots

France

AFNOR Standards (Association Francaise de Normalization) have the following robotic documents available:

E61-100	Definitions
E61-101	Designation of geometric axes and movements
E61-102	Mechanical Structure
E61-103	Performance Definitions

United States

The following is a general summary of U.S. robot standards activities:

American Society of Testing and Materials (ASTM)

- F28 Committee on Robotic Systems Subcommittee F28.02 Performance Criteria has completed a draft Standard on "Performance", also a draft Standard on a "Robot Categorization Guide".

Electronic Industries Association (EIA)

- EIA is in the process of revising *Project SP1393* to incorporate certain MAP provisions. Will reissue for industry comment as "SP1393A—User Level Format and Protocol for Bidirectional Transfer of Digitally Encoded Information in a Manufacturing Environment".
- *Project 1798*, which addresses "Extended Machine Program Command Format or Numerically Controlled Machines," is also in revision status.

Institute of Electrical and Electronics Engineers (IEEE)
The following were approved in December 1984 as a new standards: Info Systems-Networking

- IEEE-802.2-1984, Logical Link Control
- IEEE-802.3-1985, Carrier Sense Multiple Access with Collison Detection (CSMA/CD) Access Method and Physical Layer Specifications
- IEEE-802.4-1984, Token Passing Bus Access Method and Physical Layer Specification

National Fire Protection Association (NFPA)

- NFPA79, the Electrical Standard for Industrial Machinery has been updated and issued as NFPA-1985. Call NFPA at (617) 770-3500 to order copies.
- It is expected that NFPA-1985 will replace the JIC electrical standards.

Robotic Industries Association (RIA)

- R15.06 on Safety—November 1984 completed a draft "Safety Standard for Industrial Robots and Robot Systems" covering construction, installation, use and care together with safeguarding of personnel involved with these functions.
- R15.01 through R15.05 in February 1985 mailed 350 questionnaires designed to provide direction and priority of needed robot standards.

Underwriters Laboratories, Inc. (U/L Inc.)

- have developed a draft Standard "UL-1740" document covering requirements of industrial robots and associated equipment rated 600 volts or less and intended for installations in accordance with the National Electrical Code. UL-1740 contains construction and performance requirements that consider electrical shock, fire and casualty hazards.

The Robotic Industries Association has standards committees addressing the following areas: Electrical Interface, Mechanical Interface, Performance, Information/Communications, Human Interface, Safety, and Terminology. For more information on these committees, contact James Prange, RIA Standards Manager, RIA, P.O. Box 1366, Dearborn, MI 48121, USA, tel: (313) 271-7800, telex 297742.

United States Joint Ventures & Special Agreements

U.S. FIRMS	CONNECTIONS	TYPE OF AGREEMENTS
Allegheny International	Sciaky S.A.	Licensing Agreement
American robot	Rediffusion Simulation (U.K.)	Licensing Agreement
	Cyclomatic	OEM Agreement
	Technomatic	Distribution Agreement (For Benelux)
Automatix Inc.	Jungheinrich (W. Germany)	OEM & Licensing Agreements
	Hitachi	OEM Agreement with potential for Licensing Agreement
	Hirata	OEM Agreement
Cross & Trecker	Bendix Automation	Acquisition (Cross & Trecker also kept Bendix' OEM & Licensing Agreements with Yaskawa and its Marketing Agreement with Mobot)
Ransburg	Renault	Joint Venture
	Tokico (effective 1/84)	N. America Distributor Joint Venture (Hitachi owns 40% of Tokico; Tokico owns 33.5% of Ransburg Japan)
GCA	Dainichi Kiko	Marketing & Licensing Agreements
	DeVilbiss	Technical Exchange Agreement
	Inta	Technical Exchange Agreement
	WMI Robot Systems	OEM Agreement
Thermwood	Binks	Marketing Agreement
United Technologies	Niko	Licensing Agreement
Rhino Robots	Sirges (France)	Distributor
	Applied Engineering (Korea)	Distributor
	Uny (Japan)	Distributor
	Microcontact (Canada)	Distributor
	Electrolab (Canada)	Distributor
Advanced Robotics	Caterpillar Tractor	20% Equity Interest
	Nachi Fujikoshi	Marketing Agreement (Adv. sells Nachi's products)
	Oldelft (Holland)	Joint Development Agreement (in optics & laser vision)
	Real Time Systems	Joint Software Development Agreement
Machine Intelligence	Yaskawa	Joint Venture & Licensing Agreements (for 3rd generation robots & vision)

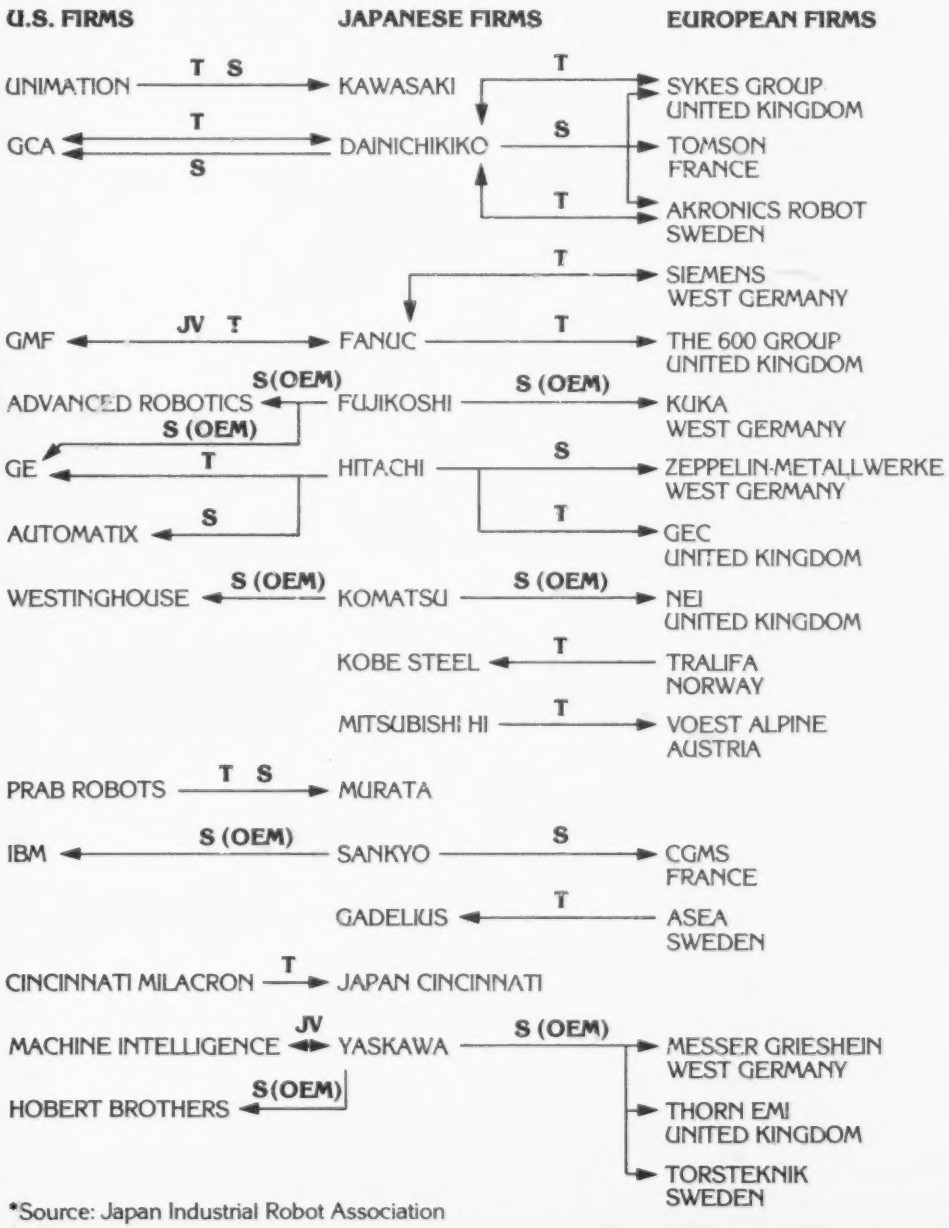
U.S. FIRMS	CONNECTIONS	TYPE OF AGREEMENTS
Machine Intelligence	VS Engineering (U.K.)	OEM Agreement
	SPL Ltd. (U.K.)	OEM Agreement
	Systecon (Finland)	OEM Agreement
	IC Control (Sweden)	OEM Agreement
	Van Rietschoten n Houwens (Netherlands)	OEM Agreement
	Tecnomatix (Belgium)	OEM Agreement
	Belgonucleaire (Brussels)	OEM Agreement
	CNC Tecnik (W. Germany)	OEM Agreement
	Fiar (Italy)	OEM Agreement
	Robomatix (Israel)	OEM Agreement
Westinghouse/ Unimation	Nokia	Licensing Agreement
	Olivetti	Licensing Agreement
	Kawasaki	Licensing Agreement
	Robotmatix	Licensing Agreement
DeVilbiss	Trallfa	Technical Exchange & Licensing Agreements
	Matsushita Industrial Equipment	OEM
	Toyama	OEM
Prab Robots	Murata	Technical Exchange & Licensing Agreements
	GdA	Exclusive Marketing Agreement for N. America
Mobot	Cross & Trecker	Marketing Agreement
GMF Robotics	International Robomation/ Intelligence Systems	OEM Agreement with Technical Exchange
	GM & Fanuc	Joint Venture
	Also, various distributors and system houses who also provide service, training and technical assistance.	
General Electric	Hitachi	OEM & Licensing Agreements
	Volkswagen	OEM & Licensing Agreements
	DEA	Licensing Agreement
IBM	Sankyo Seiki	OEM Agreement with Technical Exchange
	Also, various VARs (value-added remarketer).	

*Source: Prudential-Bache

OEM—Original Equipment Manufacturer

Joint Ventures and Special Agreements for Japan

T - TECHNICAL LINKS
S - SALES LINKS
JV - JOINT VENTURE
OEM - ORIGINAL EQUIPMENT MANUFACTURER



*Source: Japan Industrial Robot Association

WORLDWIDE DIRECTORY

Robot Manufacturers, Suppliers, Systems Suppliers and Research Institutes

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G.P.O. Box 2476V
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4850 Verviers
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L.V.D. COMPANY
Nijverheidslaan, 2
8630 Wevelgem - Gullegem
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PEGARD, S.A.
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5220 Andenne
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8210 Zedelgem
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2100 Deurne
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1338 Lasne
Mr. Woit
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151 Noereth
4700 Eupen
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2100 Deurne
Telephone: 03/322.18.51

IBM
de Hr. Warson, Weets
Victoria Regina Plantsoen 1
1030 Brussel
Telephone 02/214.21.11
02/214.23.02 (Weets)

GEVEKE/DIV. ROBOTTECHNIEK
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Telex: 76 304 Bircher

SCEMI BBC
38300 Bourgoin-Jallieu
Frankreich

ROBOTECHNIK GMBH
Z. HD. H. Bosse
Boschstrasse 12
8039 Puchheim
Tel: 089/807880
Telex: 529 313

SCHUBERT GMBH
Industriegebiet Suedost
7180 Crailsheim
Tel: 07951/5051
Telex: 74319

WEST GERMANY (Con't)

SCIAKY S.A.
Z. HD. Herrn Mille Und Giraud
119, Quai Jules Quesde
F-94100 Vitry-Sur-Seine
Frankreich
Tel: 680/8507
Telex: Sciaky 270 052 F

SCIAKY GMBH
Z. HD. Herrn Hocke
Steinmetzstrasse 2
6200 Wiesbaden
Tel: 06121/48 026
Telex: 041 865 25

SECURIA
Z. HD. H. Theobald
Postfach 11 11 15
Schleichermacherstr. 8
6100 Darmstadt
Tel: 06151/26931
Telex: 4197 143

SIEMENS AG
Z. HD. H. Alt
Postfach 700075
Rupert-Mayer-Strasse 44
8000 Muenchen 70
Tel: 089/722-26126

SIEMENS A
Z. HD. H. Schaefer
Postfach 120
Wernerwerkdamm 12-20
1000 Berlin 13
030/6208
Tel: 030/386-5513
Telex: 1810-257

STAHL
Z. HD. H. Heidborn
Kienhorststrasse 52-56
1000 Berlin 51
Tel: 030/412011
Telex: 181487

STEIN OHG
Elkan-Naumburg-Str. 35
8830 Treuchtlingen
Tel: 09142/4094
Telex: 624603 Stein D

KOPPERSCHMIDT (SPRITZTECHNIK)
Guetersloher Strasse 259
4800 Bielefeld 14
Tel: 052¼44 231
Telex: 937 383

KOPPERSCHIDT-MUELLER GMBH
Z. HD. H. Schweers
Postfach 226
Berglenstr. 23-25
7057 Winnenden 6
Tel: 07195/30 31
Telex: 7 24 464

TRALLFA GMBH
Z. HD. Herrn Hansen
Frankfurter Str. 168-176
6078 Neu-Isenburg
Tel: 06074/40 33 22
Telex: 4185611

DEVILLBIS GMBH
Postfach 91240
Justus-Von-Liebig-Str. 31
6057 Dietzenbach
Tel: 06074/2011
Telex: 4191533

UNIMA MASCHINENBAU GMBH
Z. HD. Herrn Bayer
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Justus Von Liebig-Strasse
6603 Sulzbach/Saar
Tel: 06897/3088
Telex: 04429 347 Hyda D

VOEST-ALPINE MUENCHEN
Z. HD. H. Kaestner
Eisenheimerstrasse 59
8000 Muenchen
Tel: 089/58 991
Telex: 05/212 702

VOLKSWAGENWERK AG
Z. HD. H. Welikis
Postfach
Industrieverkauf VD-3
3180 Wolfsburg 1
Tel: 05361/25 020
Telex: 09 586-0 VWW D

EXPERT MASCHINENBAU GMBH
Z. HD. Herrn Heinz
Seehofstrasse 56-58
6143 Lorsch
Tel: 06251/59 20
Telex: 0468466 Expt D

BOEHRINGER GMBH
Z. HD. Herrn Felten
7320 Goeppingen
Tel: 0716¼8 026
Telex: 041 865 25

W + M GMBH
Daimlerring 2
6200 Wiesbaden Norderstedt
Tel: 06122/7020
Telex: 4182 511 Wumd

WEST GERMANY (Con't)

AWM ODENWALD GMBH
Chamissostr. 24
7000 Stuttgart 1
Tel: 0711/654997

UNIMATION INC.
Z. HD. Frau Bruening
Industriestrasse 17
6056 Heusenstamm
Tel: 06104/63025
Telex: 410 181

MESSER-GRIESHEIM GMBH
Z. HD. Herrn Klie
Carl-Von-Linde-Strasse 25
8044 Unterschleissheim
Tel: 089/31 005-260
Telex: 521 5443 Mglm D

BARTH & POHL
Z. HD. Herrn Benner
5800 Hagen 8
Tel: 02337/1045
Telex: 823 897

ZAHNRADFABRIK
FRIEDRICHSHAFEN AG
Z. HD. Herrn Hoerl
Postfach 2520
Loewentaler Strasse 100
7990 Friedrichshafen 1
Tel: 07541/77-4000
Telex: 734 207-20

TRUMPP UND PARTNER KG
Reutlinger Strasse 34
7000 Stuttgart 70
Tel: 0711/76 33 12
Telex: 072 554 94 Trupa D

W. MERKLE
Z. HD. Herrn Merkle
8891 Koetz 1
Tel: 08221/6274-4071
Telex: 53 1126

ROBOT MANUFACTURERS

ADAPTIVE INTELLIGENCE CORPORATION
1401 McCarthy Boulevard
Milpitas, CA 95035
Tel: 408/262-7222
Contact Person: James M. Breen
Vice President Sales & Marketing

AARM™ (Adaptive Assembly Robotic Machine)-All electric, high precision, high speed, overhead gantry "intelligent" assembly workstation. Adaptive touch™ gripper provides both optical & force feedback. IBM PC compatible with all electronics self-contained within workstation.

ADVANCED ROBOTICS CORPORATION
777 Manor Park Drive
Columbus, OH 43228
Tel: 614/870-7778
Telex: 810-482-1800
Contact Person: Robert S. Fisher
Manager of Marketing

Advanced Robotics® provides fully integrated computer-controlled robotic arc welding work cells designed to meet the specific needs of its customers.

Advanced Robotics® produces a full line of robots, positioners, sensors, weld process packages, and adaptive welding controls which are integrated into turnkey systems. Advanced Robotics® provides full service and applications support for these work cells.

Product line includes Cyro® 1000, Cyro® 1350, and Cyro® 2000 work cells which are specifically designed to reduce arc welding costs and improve product quality. Programming is easy to learn and is performed with the teach pendant. These work cells can be integrated with robotic positioners designed specifically for arc welding. Advanced Robotics®' line of positioners include 2-Axis RP positioners, Drop-Center Positioners, and a 5-Axis twin table positioner. These microprocessor-controlled positioners provide high-speed parts manipulation, thereby reducing the robot's "waiting time" and increasing work cell utilization.

The CyroVision™ real-time adaptive control sensor is a three-dimensional preview vision system which allows you to robotically produce consistently high quality welds even when your part tolerances vary and joint profiles are inconsistent.

AMERICAN ROBOT CORPORATION
121 Industry Drive
Pittsburgh, PA 15275
Tel: 412/787-3000
Contact Person: Dr. Romesh Wadhwani
President & CEO

American Robot is a U.S.-based manufacturer of intelligent, electric robots, gray-scale vision systems, robotic vision application workcells and complete Computer Integrated Manufacturing (CIM) systems.

AMERICAN ROBOT PRODUCTS

- MERLIN Intelligent Robot—A six-axis robot designed to handle a vast range of applications, such as high precision assembly, arc welding, and water jet cutting.
- MINI-MERLIN Intelligent Assembly Robots—High-speed, 4-axis robots for material handling and precision assembly.
- Gantry-MERLIN—A modular gantry system that can handle a wide variety of applications that require a large work envelope.
- MERLIN Universal Controller (MUC)—A 32-bit multi-processor controller that provides complete control of the MERLIN robot family. The MUC's modular, software-intensive design allows it to be quickly interfaced to many different types of peripheral equipment.
- MERLIN Cluster Controller (MCC)—A high-performance area controller that can control a large number of robot and vision workcells and provide complete production line monitoring and control capability. Provides extensive communications capability, including SECS II and MAP.
- MERLIN Gray Scale Vision Systems—Offer a complete solution to the problems of vision-driven robot guidance and automatic inspection.

• MERLIN VISIONTRACKER—A real-time, visual seam finding and tracking system capable of complete, adaptive weld process control.

• MERLIN ROBOGUIDE system for simple 3-D vision guidance for robots.

• MERLIN MAGICEYE—for inspection of simple or complex assemblies, high-precision, non-contact gaging, flaw detection and statistical process control (SPC).

ASEA ROBOTICS, INC.
16250 West Glendale Drive
New Berlin, WI 53151
Tel: 414/785-3400
Telex: 260045
Contact Person: Thomas Bopp
Supervisor, Marketing Services

ASEA ROBOTICS, Inc. provides electric, computer-controlled robots, accessories and application engineering services for a variety of manufacturing areas. ASEA products perform arc welding, spot and stud welding, plasma spraying, deburring and polishing, material handling, machine tending, adhesive and sealant application, waterjet cutting, and assembly functions. Besides industrial robots, ASEA ROBOTICS, Inc. offers the equipment and computer software necessary to provide pre-engineered solutions to many problems involving automated manufacturing. In addition, specially engineered systems are available for applications that cannot be covered with ASEA's standard "function packages." ASEA ROBOTICS, Inc. also operates several training facilities, offering courses in robot operation, programming and maintenance. Specific products include; IRBL6/2 robot (6kg or 13 lbs. payload capacity); IRB 60/2 robot (60 kg or 132 lbs.); IRB 90/2 (90 kg or 198 lbs.); IRB 1000 pendular-design assembly robot; IRB G6/2 inverse-mounted robot; ASEA Robot Vision System; ASEA arc welding Seam Finder; robot peripheral equipment and accessories.

AUTOMATION EQUIPMENT COMPANY
11123 South Towne Square
St. Louis, MO 63123
Tel: 314/894-1123
Contact Person: Raymond J. Simone
President

VERSATILE PACESETTER IV Introduced by AEC—PACESETTER IV, a pneumatically powered non-servo robot designed for a diversity of tasks which require parts handling, machine loading and assembly operations, has been introduced by Automation Equipment Company, St. Louis.

The standard PACESETTER IV's adjustable cylindrical coordinate motions have five inches (5") of vertical travel, twelve inches (12") of horizontal travel and 270° of vertical axis (waist) rotation. Longer vertical and horizontal travel available. All motions have program-selected intermediate stop and end stops that are infinitely adjustable. Hydraulic dampening is provided for all motions.

Standard optional items include wrist motion for roll, pitch or yaw, a pneumatic gripper and a choice of microprocessor or computer based control.

The PACESETTER's "positive stop" feature results in excellent accuracy. Position repeatability is ±.001" for linear travel and ±.002" at a 20" radius for waist motion. Wrist rotation position has a repeatability of .001" at a 2" radius.

Air lines and electrical wiring are supplied to the end effector area by means of a rotary air manifold and center shaft wire passage.

The price for the basic PACESETTER IV is $6,900.00. With control and other standard options, a "work ready" unit price seldom exceeds $10,000.00. For additional information, contact R. Simone, Automation Equipment Company, 11123 South Towne Square, St. Louis, MO 63123. (314) 894-1123.

AUTOMATIX, INC.
1000 Technology Park Drive
Billerica, MA 01821
Tel: 617/667-7900
Telex: 951518 A I BLRC
Contact Person: Donna M. Desmarais
Sales Coordinator

Automatix was formed in 1980 to advance the application of Artificial Vision and Intelligent Robot systems technology. Since Automatix's inception, we have consistently introduced leading edge technology: the Autovision 3 and Autovision 4 high-speed machine vision systems; the

AI32 Universal Robot Controller; the AI32V vision-integrated robot controller and the RAIL programming language.

We target our products towards three major markets: automotive, electronics and aerospace. Our applications vary from welding to automotive sealant applications to the assembly and inspection of printed circuit boards.

Automatix provides complete training and offers complete field service support with offices all over the country, Europe and Japan. We have recently started an ASI program (Automatix Systems Integrator). This program allows a customer to contact an ASI, who then does the engineering, feasibility studies and buys the equipment from us. All ASI companies also provide complete training and field service with support from Automatix when necessary.

CINCINNATI MILACRON MARKETING COMPANY
215 South West Street
Lebanon, OH 45036
Tel: 513/932-4400, x306
Telex: 214174
Contact Person: Dale Hendrixson
Director of Marketing

Cincinnati Milacron is a world leader in machines, systems, computer controls and software for the metalworking and plastics processing industries, and in robotics and precision measuring equipment for factory automation in general. The company is also the principal independent producer of silicon epitaxial wafers for the semiconductor industry and a technology leader in precision grinding wheels and synthetic fluids for metalworking.

CITIZENS ROBOTICS CORPORATION
G-6140 Taylor Drive East
Flint, MI 48507
Tel: 313/767-9750
Contact Person: Thomas Fleetwood

CITIZENS ROBOTICS CORPORATION manufactures a 6-8 axes jointed spherical robotic arm having a load capacity of twenty-five (25) pounds and repeatability of .014 inches. The arm is operated by DC servomotors and an 8085 microprocessor with memory storage of up to 1,600 points. Programming is via teach pendant or IBM compatible PC. All electronics are mounted on board the 168 pound robot, making it truly self-contained. All of the 32 I/O ports on the robot are for user use. Base price is $24,000.00, which includes programming and maintenance training for the customer.

CITIZENS ROBOTICS CORPORATION also offers systems engineering fabrication and installation, along with special end effector designs.

Some of the applications in which Citizens robots have been installed are radioactive materials handling, packaging, foundry operations, machine loading, inspection and parts transfer, education and laboratory applications.

CYBOTECH CORPORATION
P.O. Box 88514
Indianapolis, IN 46208
Tel: 317/298-5890
Telex: Western Union—27-6256;
ITT—433-6014
Contact Person: Cynthia S. Scheel
Market Administrator

A comprehensive line of high technology industrial robots, controls and software. These products are directly marketed in the form of turnkey systems and work cells. The following market segments are addressed:

- Adaptive Arc Welding: MIG, TIG, SUB ARC
- Advanced Manufacturing: Drilling, routing, deburring, inspection, sealing, water jet cutting, laser cutting, welding, surface treatment and optical/coordinate measurement.
- Painting/Coating
- Assembly: Wire Harness Assembly Systems
- Custom Applications Software
- Off-line Programming
- Vision Systems

THE DeVILBISS COMPANY
P.O. Box 913
Toledo, OH 43692
Tel: 419/470-2021
Telex: 286-433
Contact Person: Timothy Bublick
Director—Industrial Robot Organization

DeVilbiss offers a reliable, versatile, and economically feasible product line of industrial robots for finishing, welding, and other manufacturing process applications.

ROBOT MANUFACTURERS (Con't)

DeVilbiss finishing robots have been industry's first choice for finishing since their introduction in the early 1970's.

The TR-450 and TR-4500 finishing robots are used to apply quality finishes with consistency while reducing paint usage, energy consumption, rejects, and overspray, and removing personnel from potentially hazardous environments.

The EPR-400 and EPR-405 SCARA series robots are capable of producing over 50% of the weldments required by industry today. These robots are ideal for small-, mid-sized, or large companies.

DeVilbiss also provides a full range of 5-and 6-axes articulated arm type robots including the EPR-2000 and EPR-3000 for welding and the EPR-9010 electric process robot.

The EPR-400, EPR-405, EPR-2000, and EPR-3000 (arc welding robots) are for MIG welding, DC TIG, Plasma Arc, Flux Cored, and submerged arc welding—Semi-Automatic Welding Process.

The electric process robot, EPR-9010, is used for applying glue or sealant in addition to high precision assembly and arc welding.

GCA CORPORATION, INDUSTRIAL SYSTEMS GROUP
One Energy Center
Naperville, IL 60566
Tel: 312/369-2110
Telex: 270567
Contact Person: Elizabeth E. Rittler
Advertising/Promotions Coordinator

GCA is one of the few companies in the world with a complete in-house capability for planning, engineering, manufacturing and implementing Computer Integrated Manufacturing (CIM).

GCA offers many different models of industrial robots, including conventional, pedestal-mounted models and the broadest line of overhead gantry robots available today—capable of lifting up to 2,200 lbs., in standard models, and many tons, in custom models.

GCA also offers a complete line of factory automation controls, including: the CIMROC® robot controller—the first control designed to program all makes of robots in use today; CIMCELL™—the first general-purpose, off-the-shelf cell control; CIMNET™—the first factory LAN (Local Area Network) capable of integrating virtually any computer, control, PLC, machine, robot, test station, or device with any other, regardless of vendor/brand.

Our engineers will help you evaluate potential automation applications and perform feasibility studies that lead to a top-down planning definition. We take responsibility for assuring that all robots and other automatic hardware are properly interfaced with your existing manufacturing systems.

GCA will develop a turnkey package, including hardware, software, operator training, and after-sale support, teamed with the non-GCA firms involved. And, in addition to standard products, we can deliver custom-made systems and software, suitable for any application.

GCA/Industrial Systems Group was established to develop, market, install and support computer integrated modules of the Factory of the Future (FOF). The Factory of the Future will be based upon the integration of the traditional, process-based factory technology with the emerging software- or systems-based technology of today and tomorrow.

The GCA/Industrial Systems Group is organized so as to best assist the manufacturer in accomplishing this objective over the long term (top-down planning), while providing product/service modules to meet short-term needs and allow for long-range modular expansion (bottom-up implementation).

GENERAL ELECTRIC COMPANY
ROBOTIC & VISION SYSTEMS DEPARTMENT
P.O. Box 17500
Orlando, FL 32860-7500
Tel: 305/889-1401
Telex: 466621
Contact Person: Vern Estes
Manager-Product Planning and Market Development

General Electric Company will market the following products in 1985:

- Two Scara Robot arms with 4 ½ and 22 lb. load carry capacity.
- A process robot with both five and six axes of freedom.
- Eleven models of Material Handling robots with load carrying capacity from 110 lbs. to 220 lbs.
- Three categories of robot cells as follows:
  - — Standard Arc Weld Cells
  - — Sealant and Adhesive Cells
  - — Real Time Seam Tracking "TIG" weld cell with coordinating posi-

tioner control and real time process control

- An advanced work cell controller
- A Generic Robot Controller built around the General Electric machine controller
- Both pre-purchase and post-purchase training programs

These programs address needs of Managers, Industrial and Manufacturing Engineers, Robot Operators and Robot Maintenance personnel.

GMFANUC ROBOTICS CORPORATION
5600 New King Street
Troy, MI 48098-2696
Tel: 313/641-4221
Contact Person: Jim Haugen
Vice President - Automotive Assembly Systems

GMFanuc Robotics Corporation was formed in a joint venture agreement between General Motors and FANUC, LTD. of Japan on June 23, 1982. GMF Robotics, a U.S.-based international company, designs, manufactures and sells robots and robotic systems to domestic and overseas customers.

GMF Robotics is one of the fastest growing robotics companies in the world. Its product line includes three series of electromechanical robots that perform a wide range of medium technology assignments, plus the N/C Painter, perhaps the most sophisticated robotic system performing on production lines today. Recently, the line has been extended by the addition of Vision and Offline programming systems. In the first 2-¾ years of its existence, GMF has grown in population from a nucleus of 60 when it was first formed in June, 1982, to 415 at the end of March, 1985. It is the leader of the U.S. robotics industry, having delivered over $100 million worth of robots and robotic systems in 1984, and capturing approximately 27% of the U.S. Market.

GRACO ROBOTICS, INC.
12898 Westmore Avenue
Livonia, MI 48150
Tel: 313/523-6300
Contact Person: William F. Lauersdorf, Jr.
Sales Manager

Graco Robotics, Inc. is a manufacturer of a complete line of Paint Finishing Robots. We provide total systems capability in all areas of product finishing. Our services include Engineering, Sales, Service, Manufacturing, and Turn-Key installations.

Additionally, we design and build custom programmable controller systems for process control. We also manufacture a line of photo light curtains for product sensing, and mechanical chain-type memory systems which are used in paint process control and sorting systems.

For all products manufactured and sold by Graco Robotics, Inc., we provide maintenance contracts and 24-hour per day, 7-days per week service.

IBM CORPORATION
P.O. Box 3025
Boca Raton, FL 33432
Tel: 305/998-2979
Contact Person: B. J. Haupt
Director of Sales Operations (MSP)

IBM Manufacturing Systems Products develops and markets a family of intelligent assembly and material handling robots totally compatible with the IBM Personal Computer, along with a line of industrial computers. Both robots and computers are supported by a broad variety of control and application software, including extensive communications capability.

Education for all Manufacturing Systems Products' offerings is provided in Boca Raton, Florida, along with application and sales engineering support on a regional basis. Second level maintenance service is available from Manufacturing Systems Products Headquarters in Boca Raton.

Installation and distribution of IBM robots is provided by a network of over 60 Manufacturing Systems Integrators located across the United States. Industrial Computer Products are distributed by a nationwide network of Industrial Distributors, OEMs, and IBM's own Marketing forces, such as the National Account Division and the National Marketing Division.

INTELLEDEX INCORPORATED
4575 S.W. Research Way
Corvallis, OR 97333
Tel: 503/758-4700
Telex: 752441
Contact Person: Rollie Woodcock
Corporate Communications Manager

Intelledex is a broad based supplier of automation products to the electronics and semiconductor industries. These products include intelligent assembly robots, computer vision systems, and turnkey automation systems for specific applications.

ROBOT MANUFACTURERS (Con't)

INTERNATIONAL
ROBOMATION/INTELLIGENCE
2281 Las Palmas Drive
Carlsbad, CA 92008
Tel: 619/438-4424
Telex: 182 802 Robot CSBD
Contact Person: Richard P. Carroll
Vice President, Sales

P256 Vision System—Optical inspection system for quality control, flaw detection, parts identification, robot guidance and more. Features gray-scale image processing and optional coprocessor for speed enhancement.

D256 Vision System—A stand-alone program development system for computer vision and image analysis applications. The system provides a UNIX-based, multi-user program development environment.

CB256 Inspector—The latest and most advanced system for visually inspecting stuffed printed circuit boards as well as automating the PC board rework station. System features both top and bottom side inspection and uses the IRI P256 Vision System, the best price/performance product in the industry.

MACK CORPORATION
P.O. Box 1756
Flagstaff, AZ 86002
Tel: 602/526-1120
Contact Person: Allen Baker
General Sales Manager

Mack Corporation Supplies a broad line of integrated "basic automation systems elements" under the registered trademark B.A.S.E®. These elements combine to structure reprogrammable, non-servo robot configurations for specific bench top automation applications. The B.A.S.E® product line operates in the Cartesian Coordinate System and includes X, Y and Z transporters with wrist motions in pitch, yaw and roll together with a choice of two, three and four fingered grippers. Plant air is the source of power and control is either programmable timers, programmable controllers or computers. Computer control is usually necessary when these elements are incorporated into a complex manufacturing system. Reach to eighteen inches and payload to five pounds makes it ideal for pick and place applications involving parts transfer, light assembly, loading, packaging inspection and automation testing.

MTS SYSTEMS CORPORATION
P.O. Box 24012
Minneapolis, MN 55424
Tel: 612/937-4678
Telex: 29-0521
Contact Person: Kenneth D. Compton
Marketing Manager

Systems Engineering firm that designs, builds and integrates automated systems for the factory floor. Utilize standard products and modular approach in both mechanical and electronic designs; supervision of systems is handled by microprocessors ranging from LSI 11/23 to Micro-Vax. MTS Systems tailors the software to the individual job to achieve maximum flexibility for the application while utilizing a nucleus of software common to all systems.

We work with both servohydraulic and electric drive systems with absolute position feedback and closed loop control.

POSITECH Corporation
Rush Lake Road
Laurens, IA 50554
Tel: 712/845-4548
Telex: 703034
Contact Person: James T. Cackler
Vice President, Sales & Marketing

Positech Corporation manufactures a complete line of handling equipment from simple air manipulators to fully automatic robots. Positech's robot line includes the PROBOT CC-1A, a cylindrical coordinate type with 500 lbs. of payload and tooling capacity. The CC-1A is ideally suited for machine loading, conveyor/pallet transfers and general material handling applications. Positech will design and build a PROBOT to meet the customer's needs. Some applications Positech has provided equipment for include an automatic tool changer which interfaces between a flexible machining center and an AGV, loading billets into a 7 ½" upsetter, transferring large rolls of plastic film to pre-selected pallet locations and PROBOTS for the meat-packing industry. Positech, leader in positioning technology, will design and build the right robot for the right job.

Additionally, the company designs and manufactures hydraulic cylinders and all sizes of hydraulic rotary joints, primarily for OEM's.

PRAB ROBOTS, INC.
6007 Sprinkle Road
P.O. Box 2121
Kalamazoo, MI 49003
Tel: 616/329-0835

Telex: 224468
Contact Person: E. J. Sitnay
Customer Sales/Service Liaison

Prab Robots, Inc. offers a complete line of industrial robots including spherical coordinate, cylindrical coordinate and articulated arm robots suitable for a wide range of applications. The spherical coordinate robots include Model 4200, 4200HD, 5800, 5800HD. These four axes robots (three axes for the HD models) have payload capacities ranging up to 125 pounds. The Prab F-Series robots are cylindrical coordinate units with payload capacities up to 2,000 pounds. These three axes electro-hydraulic units may be equipped with optional axes of motion up to seven. These FA, FB, FC, robots are controlled by Prab's 700 controller which features control axes module interchangeability.

Prab's line of articulated arm robots includes the five axes, G-05/G-06 robots which have payload capacities up to 33 pounds. Models G-24 and G-36 are six axes robots. Payload capacities for the G-24/26 are up to 55 pounds and the G-34/36 are up to 145 pounds. These all-electric robots, when interfaced with the Model 800 Controller, offer point-to-point and continuous path capabilities including linear, circular and spline interpolation.

Among the robot system components manufactured by a Prab subsidiary are conveyors, buffer storage devices, parts orientors, accumulators, gaging station, and automatic bin unloaders.

PRECISION ROBOTS, INC.
6 Cummings Park
Woburn, MA 01801
Tel: 617/938-1338
Telex: 4940995 HQCM
Contact Person: Peter B. Halsted
Sales Engineer

PRECISION ROBOTS CLEAN COMPATIBLE ROBOTS-Precision Robots automatic materials handling systems are designed for use in contamination sensitive environments. Originally built for the semiconductor industry, PRI robots are clean room compatible and can significantly reduce product contamination over conventional manual handling. Motions in X, Y, and Z are mechanically linear and stepper motor driven. Loads to six pounds can be positioned with repeatability better than .004". The horizontal Y-axis can be any length up to 20 feet and is a compact design which can be interfaced easily to existing process benches or fixtures. End effectors can be custom designed by our engineering staff using process compatible materials. The system controller is a proven design developed for the PRI Robot Systems. Programming is done using a simple pull down menu structure, no programming language is necessary. The controller supports RS-232 communications, as well as 32 program accessible inputs and outputs for interfacing with host computers or other process equipment.

RHINO ROBOTS, INC.
P.O. Box 4010
Champaign, IL 61820
Tel: 217-352-8485
Telex: 3734731 RHINO ROBOTS C
Contact Person: Inside USA: Cliff Emeric, National Sales Manager Outside USA: Marian Geohegan, International Sales Manager

Rhino XR Series Robotic Training System: This system is used by schools, businesses, and research institutions all over the world for education, training, and research. The basic XR Series Robotic package includes the robotic arm, power supply controller, Apple and IBM software packages, cables, tool kit, manual, and circuit diagrams. Features of the 33" (81.28 cm) high arm include DC servomotors, open frame construction to allow easy viewing of all moving parts, construction of aircraft grade aluminum and totally digital closed loop system. Features of the Mark III controller include 2 spare optically encoded ports for accessories, 2 non-encoded spare motor ports, 8 additional output and 8 input lines and compatibility with any computer with a serial RS 2326 interface and 220 or 110V. Available accessories include teach pendant, slide base, rotary and tilting carousels, conveyor, XY table, 12 interchangable grippers and user friendly software packages, etc. Also available is a comprehensive, classroom tested set of courseware with software. Flexible and affordable, the XR Series provides everything needed to teach or experiment with robotics. International sales and service is available.

RIMROCK CORPORATION
1700 Rimrock Road
P.O. Box 19867
Columbus, OH 43219
Tel: 614/471-5926

Telex: 245-401
Contact Person: William Wiesmueller

Rimrock is the leader in bringing automation to the severe environment of the die-casting shop. Their equipment is noted for its rugged engineering and low maintenance requirements while maintaining the highest degree of accuracy. Products such as the Model 310 Multi-Link Reciprocator and the Model 305 Multi-Link Ladler reduce production costs by automating key steps in the die-casting process. Based upon its expertise in die-casting and robotics, Rimrock has developed the M-7, a fully-programmable heavy-duty robot with a 50 pound capacity. Rimrock recently received patents for this robot's self-leveling clamp assembly providing seven-axis motion with only three DC drive servos. The M-7's 60-inch stroke is achieved with a unique telescoping arm design that reduces the overall size of the robot to 73 inches. This robot is fully programmable with a walk-around, hand-held teach pendant.

Rimrock Corporation is also the sales and service source for the Copperweld line of general purpose robots. These robots feature a full-range of arm/hand/wrist options that permit tailoring to the requirements of a variety of industrial applications. The R-10 handles 5 pounds (including gripper/tooling) with a 12-inch horizontal stroke, 2-inch vertical lift, and 180° rotation and arm turnover. All of the Rimrock/Copperweld robots feature walk-around, hand-held teach pendant.

ROBOTICS, INC.
R.D. #3, Route #9
Ballston Spa, NY 12020
Tel: 518/899-4211
Telex: 7109631594
Contact Person: Richard J. Pilarski
President

Robotics, Inc. is a manufacturer of continuous path, Cartesian-coordinate programmable motion equipment primarily designed for dispensing fluid chemicals in precise, complex patterns at high production rates. These systems can also be employed for other applications requiring high speed, accurate and complex path generation such as water jet cutting, drilling, routing, trimming, etc.

Robotics, Inc. is also a systems integrator for its own products into material handling and automation systems as well as a qualified representative for other selected robot manufacturers in our particular application specialties.

SHRADER BELLOWS DIVISION
OF SCOVILL
200 West Exchange Street
Akron, OH 44309
Tel: 216/375-5202
Telex: 986-323 SCH-REELWSAKR
Contact Person: Ron Kazmierski
Production Manager

Pneumatic operated re-programmable pick and place robotic systems for material handling, transferring and machine loading or unloading. Payload capabilities up to 19 pounds with 24" reach.

STEELWELD ROBOTIC SYSTEMS
unit of UNITED TECHNOLOGIES
AUTOMOTIVE, INC.
5200 Auto Club Drive
Dearborn, MI 48126
Tel: 313/593-9500
Telex: ITT 499-2426
Contact Person: Arthur M. Parker
Sales Manager

STEELWELD ROBOTIC SYSTEMS offers a complete line of Robots and Robotic Systems featuring proven NiKo Gantry and Articulated Arm Robots and STEELWELD HYPER COMPACT™ Integral-Transformer Welding Guns.

NiKo Robots are used wherever manufacturing and material handling are done. They come in a wide variety of sizes and payload capacities, and they are available with either the NiKo continuous Path Robot control or the Allen-Bradley 8200R CNC Robot Control.

STEELWELD HYPER COMPACT™ Welding Guns are available in numerous styles to suit any application. They offer unparalleled energy efficiency, not possible before, and sharply reduce downtime by eliminating secondary welding cables, the single biggest headache in resistance welding. HYPER COMPACT™ Guns may be used both as robotic end-of-arm tooling and for welding fixture applications.

Other products and services include complete Automation and Robotic Systems; including Fixturing, Transfer Equipment, Welding Presses, Welding Tip Dressers, Line Controls and Robot-to-System Integrations.

STEELWELD ROBOTIC SYSTEMS is backed by more than two decades of success in the Welding, Automation and Robotic fields. Our Applications Engineers are ready now to help you with solutions to

your knottiest processing and material handling problems. Give us a call today and put STEELWELD ROBOTIC SYSTEMS on Your Team!

STERLING DETROIT COMPANY
261 East Goldendate Avenue
Detroit, MI 48203
Tel: 313/366-3500
Contact Person: James Canner
Vice President

Sterling Detroit combines an emphasis on simplicity with the ability to provide customers with the most current, state of-the-art technology, such as vision systems.

Sterling's comprehensive in-house resources include engineering, machining and assembly. Some 800 Sterling units are already in use for die casting, forging, machine tool loading and unloading, parts transfer and plastic molding.

Sterling engineers and technicians work with each customer to develop specific solutions to individual production requirements. Robotic installations are reviewed in the context of an entire system. The goal is to meet productivity and bottom-line demands as well as production needs. When required, Sterling robots can be modified to handle secondary operations.

Sterling also offers options that allow customers to stay on the cutting edge of technology by upgrading their existing Sterling robots.

THERMWOOD CORPORATION
1910 Firman #110
Richardson, TX 75081
Tel: 214/680-2676
Contact Person: John G. Harris
National Sales Manager

Thermwood Corporation develops, manufactures, markets and services industrial robots for spray painting and material handling applications and high speed robotic machining systems. All products utilize proprietary microprocessor based control systems designed by Thermwood.

The PR Series of Spray Painting Robots consists of the PR36, PR24 and PR16. There is a model sized (and priced) just right for any spray painting application. Internal memory can store up to nine different programs totaling up to five minutes of continuous path programming expandable to 1024 programs and 10 hours with the hard disk option. Other features include DIGITAL SERVO CONTROL, PATH PERFECT EDITING, SPEED CYCLE, LINE SYNC and an INVERSION PACKAGE (for upside down orientation).

The LS (Limited Sequence, non-servo) and TC (Total Command, full servo) Series of Electric Robots are designed for assembly and material handling applications. The line includes a number of different models which can handle payloads of 10 pounds to 150 pounds.

The CARTESIAN 5 line of robotic machining systems is designed to rout, cut, drill, shape and bore a variety of materials including wood, plastic, aluminum and the new space age materials such as graphite and Kevlar composites. Three and five axis models are available as well as envelope sizes ranging from 2 x 4 feet to 5 x 10 feet. Custom models are also available. Advanced technological features range from Automatic Program Optimization to T-CAM, Thermwood's special CAD/CAM system for computer-aided flatwork parts design and computer-aided programming.

UNIMATION, INCORPORATED
Shelter Rock Lane
Danbury, CT 06810
Tel: 203/744-1800
Telex: 96651
Contact Person: Ellen Mohr
Advertising and Public Relations Manager

UNIMATION, INCORPORATED is a leading worldwide supplier of robots and robotic systems, with over 8,000 installations. The product line consists of hydraulically operated UNIMATE® robots for high speed/high payload applications such as forging, investment casting, press and machine loading/unloading, welding and finishing; and electrically driven PUMA® and UNIMATE robots for high speed/high precision assembly, welding, palletizing, finishing, test and inspection applications.

The robots operate with UNIMATION's proprietary VAL™ control and programming language. VAL is a technologically advanced control system which features communication with supervisory computers, interfacing with intelligent sensory devices and workcell process control.

In addition to ongoing development engineering, UNIMATION's System Engineering Division consists of a staff of knowledgeable engineers with experience in virtually all manufacturing disciplines.

Activities range from design and manufacture of end of arm tooling and simple, single-robot installations up through multi-robot systems. A large applications laboratory allows customer demonstrations on all

robot models, and system run-offs prior to installation.

A staff of skilled field service and installation engineers and a customer training and technical publications department round out the organization. The breadth and depth of UNIMATION's total organization is its assurance to customers of full support and dependable products.

UNITED STATES ROBOTS
650 Park Avenue
King of Prussia, PA 19406
Tel: 215/768-9210, x 213
Telex: 882508
Contact Person: Gordon B. Hetherston
Applications Engineer

USR designs, manufactures, and markets several different general purpose intelligent robot systems for use in small parts assembly, applying adhesives, machine loading, and other material handling tasks. In addition, our uniquely designed Class 10 clean room compatible robots are recognized as industry leaders within the semiconductor, pharmaceutical and other clean room oriented industries.

We are dedicated to the flexible automation of your manufacturing facility. Our ability to interface with a host computer by means of several protocols, including SECS II, provides for the smooth integration of our robotic systems into larger, CIM-based systems.

Our applications group has the expertise to work with you on developing a variety of workcell designs which can meet your specific requirements. From complex fingertooling to turnkey multiple robot systems, our Factory Automation Department will implement these designs to offer solutions for your automation needs.

UNIVERSAL INSTRUMENTS CORPORATION
P.O. Box 825
Binghamton, NY 13902
Tel: 607/772-7842
Telex: 510-252-1990
Contact Person: Walter H. Kintner
Program Manager, Robotics

Universal Instruments provides turnkey robotic systems for the assembly of non-standard components to electronic circuits. The basic manipulator is a five axis cartesian axis robotic positioning system. Options include material handling conveyor models, component input feeders and various end effect and clinch tooling. A robot software control is provided with multiple program storage, program generation and editing, system diagnostics, and management information.

DISTRIBUTORS

A.K.R. ROBOTICS, INC.
35367 Schoolcraft
Livonia, MI 48150
Tel: 313/261-8700
Telex: 8102428788
Contact Person: Robert I. Bechek
Vice President and General Manager

Sales, service, and applications engineering of robotic finishing systems.

APPLIED ROBOTICS, INC.
18 Avis Drive
Latham, NY 12110
Tel: 518/783-1818
Contact Person: Martin J. Rosenkranz, III
National Sales Manager

The XChange™ System, a robot tool exchanging system, allows virtually any robot on the market to quickly change one specialized gripper or tool for another, automatically. This system allows a single robot to perform different tasks that presently require complex tooling or multiple robots, thus radically expanding the robot's versatility. Available in five different load-carrying sizes, the XChange™ can pass up to thirty-one electrical lines, two coaxial transmission lines, and four pneumatic or vacuum lines (six in the largest model including dripless water connections).

Gripper Systems are available in off-the-shelf, standard versions, in single or dual configurations, as well as design and manufacture of end-effectors requiring custom engineering.

The Systems Division develops, designs, engineers and installs turnkey robotic systems as well as providing feasibility studies, plant surveys, tools design and fabrication plus training and maintenance services.

BINKS MANUFACTURING COMPANY
9201 West Belmont Avenue
Franklin Park, IL 60160
Tel: 312/671-3000
Telex: 728367
Contact Person: James H. Rice
Manager, Robot Division

The Binks Manufacturing Company and its subsidiaries are designers, manufacturers and distributors of spray finishing

and coating application equipment. The product line includes air, airless, electrostatic and plural component spray guns, fluid material handling equipment, spray booths, ovens, automatic spray coating machines, and industrial finishing robots. Sales and service facilities are available worldwide.

DAEWOO HEAVY INDUSTRIES
100 Daewoo Place
Carlstadt, NJ 07072
Tel: 201/438-8288
Contact Person: K. J. Chae,
General Manager

Articulated Robots for arc welding, flame cutting, palletizing and sealing applications. Six axes driven by DC motors permit positioning repeatability of ±0.008 inch. Maximum load capacity is limited to 22 lbs. Programming through a teach and playback method or remote programming with a personal computer can be applied. Positioning is either point-to-point or continuous path.

EATON-KENWAY
515 East 100 South
Salt Lake City, UT 84102
Tel: 801/530-4000
Telex: 389-470
Contact Person: Mark Houmard
Communications Manager

Automation products to implement material flow: Automated Guided Vehicle Systems (AGVS); Automated Storage/Retrieval Systems (AS/RS). Material handling systems to interface with robotic work stations and FMS. Complete design, software, simulation and implementation services, for real-time computer control of integrated systems.

FIBRO, INCORPORATED
139 Harrison Avenue
P.O. Box 5924
Rockford, IL 61125
Tel: 815/229-1300
Telex: 499-2578
Contact Person: Kathy Boland
Office Manager

Robotic Modules: gantries, grippers, rotary and linear modules.

GENERAL NUMERIC CORPORATION
390 Kent Avenue
Elk Grove Village, IL 60007
Tel: 312/640-1595
Telex: 210-036
Contact Person: Beau Remien
Communications Coordinator

Robot Controls: RCM 1 & 2; Robot Optical System: Videomat; AC and DC feed motors and drives for robotic applications; Complete training and service in North America.

SUWA SEIKOSHA COMPANY, LTD/
KANEMATSU-GOSHO (U.S.A.), INC.
400 Cottontail Lane
Somerset, NJ 08873
Tel: 201/271-7559 or 7558 or 7557
Telex: ITT 420289; RCA 232101; WUT 130707; WUI 620756; TWX 7109910048
Contact Person: Fred Hide
Manager

Kanematsu-Gosho (U.S.A.), Inc. has been chosen by Suwa Seikosha, the well-known manufacturer of SEIKO watches, to distribute its "ACCUSEMBLER" line of precision assembly robots to the North American market. Since being introduced at the ROBOTS 8 Exhibition last year, ACCUSEMBLER SCARA and Cartesian robots have been employed very successfully for a number of such electronic and mechanical applications as surface-mounting, palletizing, pick-and-place, gluing, insertion, lubrication, odd-shaped component assembly, etc. Originally created in Japan to assemble minute watch parts, these robots feature a high degree of precision and rapid arm movement. ACCUSEMBLER robots are and will be supplied to end users through distributors including KG itself and system integrators. KG (USA) has a demonstration and warehouse facility in Somerset, New Jersey, where a variety of ACCUSEMBLER robots and spare parts are stocked to enable robot demonstration and prompt deliveries of robots and parts. Engineers from Suwa Seikosha are stationed at the Somerset facility to support customers in the area of technical matters with KG (USA) staff members.

KOMATSU AMERICA CORPORATION
35522 Industrial Road
Livonia, MI 48150
Tel: 313/464-6390
Telex: 23-4204
Contact Person: H. Mogi
Technical Sales Manager

- ARC WELDING ROBOT
  - — Type: Cartesian Coordinate type & articulated type
  - — Main Features:

1) Real-time arc sensor tracking capability
2) Automatic wire touch sensor detective capability
3) Easy establishment of welding conditions through CRT communications
4) Easy to organize unmanned welding FMS thanks to above tracking and detecting capabilities

- HANDLING ROBOT WITH INTELLIGENT VISUAL SENSOR
- INTELLIGENT BOLT TIGHTENING ROBOT

MITSUBISHI ELECTRIC SALES AMERICA, INC.
799 North Bierman Circle
Mt. Prospect, IL 60056
Tel: 312/298-9223
Telex: 270636
Contact Person: Seiichiro Kurosawa
Marketing Manager, Industrial Machinery Division

Distributing Mitsubishi Electric Corporation's industrial and educational robots (MELFA series); Industrial Robots for Arc Welding and Assemby; Educational Robots.

REIS MACHINES, INC.
1150 Davis Road
Elgin, IL 60120
Tel: 312/741-9500
Telex: 910-251-4481
Contact Person: Dick LaRue
National Sales Manager

INDUSTRIAL ROBOTS:
Linear Models—LR 1003, LR 1303, LR 1603 & LR 2003. 3 axes available with option of two controllers and choice of pneumatic, hydraulic, or electric drives for automated load/unload applications.

Extraction Model—All electric 3 or 4 axes with exceptional speed for 180° per second. 33 lbs. lift capacity. Repeatability to ±004". For pick & place applications.

V15 Model—All electric 6 axes articulated arm design with speeds of 180° per second. 33 lb. lift capacity. Repeatability to ±.004". For complex applications of machine load/unload, assembly, glueing, welding, deburring and others requiring fast cycle times.

H15 Model—A unique all electric combination of a cylindrical coordinate and articulated arm design. This 6 axes robot has a 360° work envelope with speeds up to 180° per second. 33 lb. lift capacity with repeatability of ±.004". For applications of machine load/unload, palletizing material transfer, deburring, glueing, welding.

RR625 Model—An all electric 6 axes cylindrical coordinate/jointed arm design. Lift capacity of 88 lbs. 360° work envelope with 2.15 sq. ft. floorspace requirement. Perfect for palletizing, material transfer and machine tending tasks.

RR650 Model—Same as RR625 except lift capacity of 110 lbs.—Reis Machines also manufactures and markets a full line of Spotting and Tryout Presses for the die cast and molding industries.

TOKICO AMERICA, INC.
(Supplier for North American market)
15001 Commerce Drive, N.
Dearborn, MI 48120
Tel: 313/336-5280
Contact Person: Dennis S. Piggott
National Marketing Manager

Supplier of ARMSTAR robotic systems for air, airless and electrostatic spray finishing, powder coatings, FRP coatings, adhesives and sealants. Robot demonstration lab at Dearborn location for customer demonstrations and testing. Services include applications, installation and service engineering.

TOWA CORPORATION OF AMERICA
1313 S. Pennsylvania Avenue
Morrisville, PA 19067
Tel: 215/295-8103
Telex: 843484 TOWA Corp. Morv
Contact Person: Edouard Jordi
Sales Manager

TRANSMANN II Material Handling Robot—The TRANSMAN II is a digital DC servo-driven material handling robotic system. It is ideal for repetitive loading and unloading operations of bulky, heavy, cumbersome work materials. Now you can employ a robotic system that can give you a one year pay back.

Flexibility of design permits column, monorail or gantry installation to fit virtually any type of work envelope. This robot is designed on a compact building block format so that you can select the mode needed to fit your flexible manufacturing system. This design permits a modular customized application without the need for costly engineering outlay.

Y-MAN—All Electric Industrial Manipulator—The Y-MAN manipulator is an electrically powered, servo-controlled work handling device designed to assist an

operator in handling heavy objects. Use of the Y-MAN can virtually eliminate stress and fatigue from many previously tiresome jobs. This not only results in making the job more acceptable to the operator, it also eliminates injuries and accidents common to heavy lifting.

JERVIS B. WEBB COMPANY
World Headquarters, Webb Drive
Farmington Hills, MI 48018
Tel: 313/553-1000
Telex: 211892 JWEBB UR
Contact Person: Anne M. Knisely
Director, Public Relations

With more than 65 years in the material handling field, the Jervis B. Webb Company is a leading designer and builder of integrated material handling systems. Webb's engineering department provides the knowledge and experience necessary to integrate such varied material handling equipment as automated storage and retrieval systems, automatic guided vehicle systems, unit-load handling conveyors, overhead and inverted conveyors and system controls. The Webb Company's engineering is performed completely in-house. This single-source responsibility assures the customer of the right custom-engineered material handling system to meet his requirements. As the largest total material handling company in the world, the Jervis B. Webb Company has the capability to engineer, build and install turnkey material handling/manufacturing systems for any industry.

YASKAWA ELECTRIC AMERICA, INC.
305 Era Drive
Northbrook, IL 60062
Tel: 312/564-0770
Telex: 270197
Contact Person: Shin-Ichi Kaneda,
General Manager
Kazu Okabe, Marketing Manager

Yaskawa provides MOTOMAN robot series. Motoman is one of the best selling robots in the world. Approximately 5000 units are now in use in various applications such as arc welding, spot welding, material handling, assembly, and adhesives, inspections, etc.

Motoman series features various models from small payloads of 6 lbs. to heavy payloads of 264 lbs. The following options are available depending on the model: ceiling mount, wall mount, manipulator, computer communication, palletizing, 3-D shift, seam tracking, coordinated axes and much more.

Yaskawa Electric is a major producer of industrial motors, drives and CNC's. All components of Motoman robots are products of Yaskawa.

Motoman robots, which are sold and serviced worldwide, are backed by technical application and system-design assistance.

ACCESSORY SUPPLIERS

ABEX CORPORATION
6 Landmark Square
P.O. Box 10268
Stamford, CT 06904
Tel: 203/328-3200 Telex: 643010 US and 62933 Int'l
Contact Person: G. O'Brien
Vice President, Fluid Power Group

ABEX Corporation is a worldwide manufacturer of components for robots and automation systems. The ABEX Denison Division supplies hydraulic systems and components including servo-valves, proportional control valves, electronic controls and interfaces, vane and piston pumps and motors, as well as a complete line of directional, flow, check and pressure control valves in modular stack, flange mounted or standard mounting configurations.

The ABEX Mead Division supplies a complete line of pneumatic valves, cylinders and accessories which are particularly suitable for robotic and automation applications because of their light weight, compact size and high reliability.

ABEX also manufactures friction materials for brakes and control systems, investment and special alloy castings and special gears and bearings.

ABEX has plants, sales and service locations throughout the world to provide immediate customer and product support.

AIM CORPORATION
10000 S.E. Pine Street
P.O. Box 16457
Portland, OR Tel: 503/255-7364
Telex: 36-0206
Contact Person: Dennis Hall
President

ROBOT ACCESSORY (Con't)

AIM's motto is "Systems for Assembly." This could be anything from a single hand-held air or electric driver up to a fully integrated system that includes automatic fastener feeding, X.Y.Z's driven by PC's with pick and place attachments. AIM also provides peripheral accessories and equipment such as automatic screw sorting and qualifying which improves basic system performance.

ALLEN-BRADLEY CO.
747 Alpha Drive
Highland Heights, OH 44143
Tel: 216/449-6700
Telex: 241146
Contact Person: R. Jay Jeffery
Manager, Robotics & Drives Products

The Allen-Bradley Systems Division manufactures a broad line of motion control components and systems applicable to the robotics industry. The products range from simple single axis slide drive programmable controllers to complex general purpose robot controls. The Fastrak 4000 automation controller is a compact, user friendly point to point stepping motor controller with capabilities for up to 4 axes. The PLC-2-30 is a modular medium scale programmable controller with closed loop DC servo motion control capability. The 8400GP is a low cost closed loop, high speed contouring motion controller with capability for up to six axes of electric drives. The 8200 Robot Control is a high performance, modular, multiaxis robot control capable of controlling complex articulated robot geometries. Allen-Bradley also manufactures a family of P.W.M. DC servo amplifiers capable of providing fast response high accuracy motion control of electric robots with continuous ratings ranging from 12 AMPS at 100VDC to 60 AMPS to 150VDC.

AMERICAN CYLINDER CO.
120 Main Street
Peotone, IL 60468
Tel: 312/258-3935
Contact Person: Joseph J. White
President

American Cylinder manufactures small bore pneumatic cylinders. American's Stainless Series line of cylinders are offered in 7/16", 9/16", ⅞", 1 1/16", 1 ¼" and 1 ½" bore. The cylinder has a stainless steel body and is non-repairable. The 76 Series are hard coated aluminum body cylinders available in ¾", 1 ⅛", 1 ½", 2" and 2 ½" bore sizes. American's CR Series cylinders are offered in ¾", 1 1/16", 1 ¼" and 1 ½" bore. The CR Series are designed to meet the corrosive conditions of the environment. American Cylinders are sold in U.S. and in Canada by over 70 stocking distributors.

ANDCO ACTUATOR PRODUCTS, INC.
300 French Road
Buffalo, NY 14227
Tel: 716/681-7400
Contact Person: B.W. Daube
Marketing and Sales Manager

The Posi-Tork® Series 7000 Ball Screw Linear Actuator is designed and built to meet the requirements of high speed, high force applications in automated production plants. Typical applications include shuttles, elevators and positioners for machining lines, assembly operations, foundry cores, and various other material handling needs.

These electromechanical devices eliminate many of the problems common to fluid power systems and their related controls. Intermediate positioning, constant speed or position feedback signals are all simple matters with the Posi-Tork® 7000 Series. Standard speed ranges are available to 20 inches per second for loads up to 580 pounds, and loads up to 5200 pounds can be handled at speeds up to 4.2 inches per second. All units have reserve power, more than ample to overcome static friction forces. All units include thrust overload protection/control.

Controls are available for controller acceleration and/or deceleration with precise, repeatable linear positioning within 0.001 inch over a 36 inch actuator travel.

Solid state position limit switches are also available as an integral part of the actuator positioning system.

APPLICATION AUTOMATION
Division of AEC, Inc.
850 Pratt Blvd.
Elk Grove Village, IL 60007
Tel: 312/593-5000
Telex: 287426
Contact Person: Tony Mass
General Sales Manager

Application Automation has a wide variety of both pick and place as well as servo-controlled robots primarily for the plastics industry. The AEC/HARMO robot line incorporates over 20 different models of robots in two and three axis configurations. Applications vary from sprue and runner removal from subgated molds to part removal in three axis configurations

ROBOT ACCESSORY (Con't)

using custom end of arm tooling to remove and verify parts. Three axis rectilinear robots with varying stroke lengths and weight capacities can perform secondary operations such as degating or placing parts into fixtures outside the molding machine. The TITAN series robots are applicable for molding machines up to a 4,000 ton range. These units are capable of up to 6 axes of programmable motion and are extremely flexible in their capabilities to precisely orient parts and lift large parts out of the molding machines. Application Automation is also a systems integrator for the Panasonic line, PANAROBO—a complete line of servo robots. This line is available in several different coordinate systems including rectangular, spherical and jointed arm motions. These units utilize DC-servo motors and numerical control with a high degree of speed and precision in their motions. They are particularly applicable to downstream part transfer, assembly or palletizing operations.

ARONSON MACHINE COMPANY
1001 W. Main Street
Arcade, NY 14009
Tel: 716/492-2400
Contact Person: John Capozzi
General Manager

The most complete line of robotic welding positioners available from a single source. Aronson offers a series of part positioners with infinite positioning or coordinated motion capability. Customers also have a choice of robotic indexing type part positioners as well. Aronson Machine Company offers 47 standard robotic positioner models that can handle a range from a few pounds up to 85,000 pounds. The Axitrol Programmable Controller can be offered to supplement the robot's control where necessary.

A.S.R. SERVOTRON, INC.
7945 Deering Avenue
Canoga Park, CA 91304
Tel: 818/999-6193
Telex: 181213 ASR USA CNPK
Contact Person: Robert W. Ferran
Executive Vice President

PWM Transistor Servodrivers; Permanent Magnet D.C. Servomotors; Brushless D.C. Servosystems; Industrial Positioning Systems.

ATCHLEY CONTROLS, INC.
6933 Eton Avenue
Canoga Park, CA 91303
Tel: 818/346-3500
Contact Person: Raymond Atchley
President

We offer a broad line of hydraulic and pneumatic servovalves for various markets including robotics, undersea vehicles and forest products.

AUTOMATED SYSTEMS DIV.,
SPS TECHNOLOGIES
Township Line Road
Hatfield, PA 19440
Tel: 215/721-2100
Telex: 846189 HALD
Contact Person: Charles D. Wenzel
Manager, Business Development

The Automated Systems Division designs and implements computer-directed integrated material handling systems. These usually consist of some form of automated storage and transport elements, controlled by an on-line computer that tracks materials and accumulates material data.

Systems are designed for the automated factory as well as the automated warehouse. They provide "turnkey" type systems for a variety of applications.

SPS' study group performs formal studies of material and activity available as well as opportunities for automation.

AUTOMATION INTELLIGENCE, INC.
1200 West Colonial Drive
Orlando, FL 32804-7194
Tel: 305/843-7030
Telex: 564371
Contact Person: Marjorie Buckley
Manager, Marketing Communications

AI's product line can be divided into three segments: flexible manufacturing systems (FMS), computer-integrated manufacturing (CIM) software products and machine vision systems.

FMS—Automation Intelligence manufactures a complete line of products for flexible manufacturing systems (FMS). These products include FMS area control hardware and software based on the DEC VAX series of minicomputers. AI's FMS products include CNC, robot controls, and cell controllers as well as communications network systems and intelligent behind-the-tape reader interface units.

ROBOT ACCESSORY (Con't)

CIM software—A significant portion of AI's FMS capabilities revolves around its computer-integrated manufacturing (CIM) software bridge developed to allow manufacturers to take computer-generated data from CAD system and format it for direct use by a machine tool. The specific CIM software products produced by AI are known as APT, Generalized Postprocessor and WESTURN

Machine Vision—Opti-Vision™ is an intelligent sensor designed for robotic guidance, inspection, and flexible assembly systems. It is a high performance system with both binary and gray-scale processing capabilities.

BALLUFF INC.
8054 Production Avenue
P.O. Box 937
Florence, KY 41042
Tel: 606/727-2200
Telex: 24-1932
Contact Person: Dr. Jeffrey W. Smith
Marketing Manager

Inductive Proximity Sensors; Opto-Electronic Proximity Sensors; Encoders; Programmable Controllers.

BANNER ENGINEERING CORP.
9714 10th Avenue, N.
Minneapolis, MN
Tel: 612/544-3164
Telex: 29-1011
Contact Person: Floyd Schneider
Sales & Marketing Manager

Banner Engineering Corp. manufactures the broadest line of photoelectrics and fiber optics in the world. Our Multi-Beam series with fiber optics and our Micro-Amp system of miniature amplifiers and remote sensors is ideally suited for use on robotic applications. Besides the hundreds of standard fiber optics available from stock, custom fibers are built on a daily basis. Our standard products offer a choice of over 20,000 controls for photoelectric sensing. Photoelectrics is our only business—we have become known as the photoelectric specialist.

BARRY WRIGHT CORPORATION/
PRODUCTS FOR FLEXIBLE
AUTOMATION
700 Pleasant Street
Watertown, MA 02172
Tel: 617/924-2929
TWX: 710-327-1290
Contact Person: Peter N. Cholakis
Product Line Manager

Barry Wright/Products For Flexible Automation manufactures and markets robotic end-of-arm tooling and other automation components and accessories.

Products include: Astek™ FS6-120A six-axis force sensor with onboard microprocessor, Astek Accommodator™ remote center compliance (RCC), Astek GTP-45 angular jaw grippers, parallel grippers, Sensoflex™ VGC100 compact vacuum grippers with onboard contact and grip sense, gripper pads, overload protection devices, and TS402-1 tactile system.

All products are supported by in-house project engineering and field application engineering. Existing products can be modified to meet specialized requirements.

Products supplied by other Barry Wright businesses include: fiber optic products, shock and vibration isolators, power transmission couplings, air silencers, mechanical and AC motor speed controls, power workholding systems, linear actuators, and pneumatic isolation systems.

BEI MOTION SYSTEMS COMPANY
166 Geary Street, Suite 1400
San Francisco, CA 94108
Tel: 415/788-6840
Telex: 910-380 5402
Contact Person: Neal Hinkle
Vice President, Marketing

BEI Motion Systems Company, a subsidiary of BEI Electronics, Inc., is a high technology design and manufacturing business having operating plants in six locations. Principal activities are the development and manufacture of precision electromechanical electronic products and systems for industrial, aerospace, military and commercial customers.

Digital Products Division: Design and production of state-of-the-art pointing and positioning components and servomechanisms. Specialties include space and military mission rated components and systems.

Industrial Encoder Division: Design and production of lower resolution high accuracy optical incremental encoders primarily for industrial machine tool and process control applications.

General Control Systems Division: Design and production of custom industrial motion control systems for industrial automation, with complete turnkey distributed process control and machine digital control systems up to 16 axes per system.

ROBOT ACCESSORY (Con't)

Position Controls Division: Design and production of midrange resolution high accuracy optical absolute encoders primarily for industrial process control and scientific instrument applications.

Computer Products Division: Design and production of small cost-effective incremental encoder products serving the computer peripheral medical and robotic markets.

Kimco Division: Design and production of brushless DC PM motors and linear and rotary moving coil actuators for industrial and aerospace applications.

BELL INDUSTRIES
Technical Products Division
3590 West 3rd Avenue
Eugene, OR 97402
Tel: 503/683-2355
Telex: 152556 (SEA)
Contact Person: Kurt Schauwecker
General Manager

Programmable Sequencing Valve (PSV)—A simple premanifolded assembly of ten three-way normally closed poppet valves for control of air or oil to 124 PSIG max. Each valve is independently programmable for pressure or exhaust function in each of twelve steps. Unit is programmable for single step on signal input or run through any number of steps. "Homing" to start position is also programmable. Dual isolated inputs are included for selecting step input where two input signals overlap but only one is to be read. PSV operates on 120 volt single phase, it's 18.5 inches x 7 inches x 4.5 inches and weighs 16 lbs. 8 oz.

CHUGAI INTERNATIONAL CORPORATION
One Ames Court
Plainview, NY 11803
Tel: 516/349-9080
Telex: WU 968-563
Contact Person: Todd H. Whitaker
Vice President, Electronics

Electro-optics for imaging. Complete representation of solid-state miniaturized camera, CID and CCD. Standard and custom optics, manual and motorized. Monochrome and color display devices. AC servomotors and gearheads, DC micro motors and gearmotors.

COGNEX CORPORATION
72 River Park Street
Needham, MA 02194
Tel: 449-6030
Telex: 948022
Contact Person: Lynn Hennessey
Public Relations Specialist

The DataMan 1000 Data Acquisition System is a sophisticated machine vision system for reading alphanumeric characters.

The Checkpoint 1100 is a high-speed vision system that you can train to inspect any object and provide quality control and production diagnostics. It can inspect objects for deviations in position, critical dimensions, shape, and contrast, and can detect flaws or defects in an item's appearance. It is a user-trainable system which can handle a variety of applications. In the electronics industry, it inspects laser markings on semiconductor wafers. In the pharmaceutical and food industries, it verifies date and lot codes. In the automotive and aerospace industries, it inspects castings, metal stamping, and component assemblies.

The Checkpoint 1200 Print Inspection System is a high-speed, high-resolution vision system that measures the quality of printed characters or symbols.

The Checkpoint 1300 is an automatic vision system designed for high-speed inspection of consumer and industrial packages.

The Checkpoint 1500 accurately and consistantly detects assembly defects in loaded printed circuit boards before solder.

COMPACT AIR PRODUCTS, INC.
Highway 123, P.O. Box 176
Westminster, SC 29693
Tel: 803/647-9568
Telex: 701807
Contact Person: Lance Yuda
Vice President

Compact Air Products is a manufacturer of pneumatic automation components for the machine tool, robotics, assembly and other O.E.M. and user markets. "Automation Components" include over 50 models of pneumatic grippers and end effectors. Available in both 2 & 3 jaw models, round and square body designs and with or without jaws. Gripping forces range from a few ounces to over 8000 pounds at 100 PSI shop air pressure. Typical applications include robotic end effectors for material handling machine tending and assembly

robots, grippers for pick and place devices, shears and bench top collet type work-holding devices for unusual shapes and assemblies.

Other products include over 1000 pneumatic, low profile type air cylinders used in tooling, fixtures, jigs and other automated processes. Eleven bore sizes are available from ¾" to 8". Stock strokes range from ⅛" to 4". Options include Husky(tm) heavy duty rod bushing non-rotating rod, adjustable stroke, double rod ends, seals to 500°F, nylon-brass or bronze rod bushings and round or square bodies.

All items listed above are cataloged and stocked items at Compact Air Products or one of over fifty distributors worldwide.

CONTRAVES CSR/POWERTRON DIVISION
632 Ft. Duquesne Blvd.
Pittsburgh, PA 15222
Tel: 412/261-8608
Telex: 4423016
Contact Person: Bjorn Karlstrom
Marketing Manager

Manufacturers of AC and DC high performance servo motors and servo controls including: C400/F560 series ceramic magnet DC servo motors for general purpose applications with torque requirement from 12 to 500 lb.-in.

R400 series rare-earth magnet DC servo motors with patented square design for robotics and material handling applications (40-60 lb.-in.)

NC600 PWM servo amplifiers in space saving plug-in configurations for up to 8 axis in a 19" rack.

MACS-series brushless rare-earth magnet AC servo motors in 4 frame sizes from 3" to 7.5" dia. and torque range from 11 to 700 lb.-in. These motors offer unmatched torque/inertia ratio with acceleration rates to 220,000 rad/sec^2 and very low weight. The MACS series also includes a space saving disc rotor motor (type ACA) with very short housing. The MACS series is accompanied by a complete line of modular AC servo controllers (AC800) which can be configured from 1 to 8-axis systems.

The company also designs and manufactures a line of frameless AC torque-ring motors with OD from 1 ¼" to 63".

EG&G RETICON
345 Potrero Avenue
Sunnyvale, CA 94086
Tel: 408/738-4266
Contact Person: Mary Lautner
Publications Manager

EG&G Reticon makes semiconductor integrated circuits designed for analog signal processing and optical image sensing, as well as cameras that use those image sensors. Various analog signal processing chips we manufacture are used as delay lines; other circuits operate as switched capacitor filters capable of a number of active filter functions, including SCF's specially designed for modems; and still others are used as transversal filters performing complex signal processing operations. The image sensors consist of an array of photodiodes whose output signal is conditioned to provide video images or computer data that, in turn, can be interpreted or acted upon in different ways. These image sensors (line, area, or circular scan) perform optical character recognition, facsimile transfers, spectroscopy, and manufacturing process control. EG&G Reticon's solid state cameras apply the speed, precision, and reliability of this advanced photodiode array technology to measurement, inspection, and pattern recognition problems. The cameras (line, area, and cicular scan),provide reliability in industrial environments, performing sorting, positioning, and counting at high speed. Reticon interface boards allow direct connection of several Reticon cameras to several common computers. The boards convert camera signals to computer-compatible data and store data for retrieval.

EG&G TORQUE SYSTEMS
36 Arlington Street
Watertown, MA 02172
Tel: 617/924-6000
Telex: 951736
Contact Person: John Flynn
Marketing Manager

Motors—A complete line of permanent magnet D.C. servo motors ranging from 1/10 h.p. to 1 h.p., with design features including: low cogging, long brush life and rugged construction; as well as a new line of 3", 4 ¼" and 6" brushless motors featuring: finned motor housings for better heat dissipation; good torque to weight ratios; and greater acceleration rates.

ROBOT ACCESSORY (Con't)

Amplifiers/Drives—A broad selection of linear and multi-axis pulse width-modulated (PMW) servo controllers, 20-2500 watts. Amplifiers are provided with overload protection circuitry, as well as quick and easy adjustment of gain and feedback parameters. Also available is our line of brushless servo amplifiers designed for use with our brushless motor series.

Digital Positioning Systems—Either single-axis or multi-axis microprocessor motion profile control systems. Our versatile designs allow either stand alone or host-computer controlled operation.

FABRICATION SPECIALTIES CO.
4160 Little York Road
Dayton, OH 45414
Tel: 513/890-6700
Contact Person: Martin Clark
Vice President, Marketing

Fabrication Specialties Co. manufactures a full line of FABSPEC robotic grade positioners. These positioners are only top quality components including our own proprietary gear box which provides the best backlash and repeatability specifications available today. Products include the GD series of twin-table (5) axis positioners, the AK series of single-table, two axis positioners, the HS series of single, horizontal-axis positioners with a vertically mounted work surface, and the TT series of single, vertical-axis turntable positioners. FABSPEC positioners also provide easy interface and programming using our own user-friendly controls. These features improve productivity, operator safety and longevity.

FESTO CORPORATION
395 Moreland Road
Hauppauge, NY 11788
Tel: 516/435-0800
Telex: 96-8399
Contact Person: Thomas B. DeStefani
Vice President, Sales

Festo is a global manufacturer of a complete line of over 3000 pneumatic components used for low-cost automation of manufacturing, processing, production, assembly, testing and packaging operations.

Cylinders: single and double acting, shortstroke, rodless, plastic, rectangular; Cylinder/Valve Combinations and Shock Absorbers.

Valves: manual, mechanical, pneumatic, solenoid, basic, time delay, quick-exhaust, soft-start, metering.

Sensors: back pressure actuated, reflex, air barrier, pressure amplifiers.

Flow Controls: check, needle, flow, cam operated, OR, and quick-exhaust shut-off, pressure switches.

Converters/Transducers: electrical limit switches, pneumatic-electrical switches, electrical proximity switches, pneumatic proximity switches, vacuum-pressure-differential pressure switches.

Vacuum Generators and Suction Cups.

Pneumatic Controls: stepper modules, 12-step sequencer, integrated-pneumatic circuit board.

Filter-Regulator-Lubricators, Indicators, Counters, Gauges.

Fittings and Accessories: tubing, hose, connectors, couplings, silencers, multi-distributors manifolds, reservoirs, tube cutters.

Special Units: rotary index tables, slide tables, pneumatic feed units.

Training Systems in Control Technology: pneumatics, hydraulics, electro-pneumatics, electro-hydraulics.

GIDDINGS & LEWIS ELECTRONICS
666 South Military Road
Fond du Lac, WI 54935-7258
Tel: 414/921-7100
Telex: 910-275-1100
Contact Person: David J. Kane
Marketing Engineer

PiC409 and PiC49 Programmable Industrial Computers—STAT-PAC™ Statistical Process Controller.

The PiC 409/49 Programmable Industrial Computer is a flexible automation control for robotic machines. The control may be easily programmed for point to point continuous path contouring applications through standard software routines. Over 60 Call Routines are contained in the software library including circular and linear interpolation, master/slave control, floating point math, video display output and many others.

The Call Routines and programmable logic are implemented through ladder diagram programming. The GLLADD II software package permits off-line programming, program documentation and file storage with an IBM personal computer.

STAT-PAC™ is a dedicated PiC49 control with a special statistics package for collecting data from other controls and

gaging equipment. Statistical average and range graphs, histograms and data tables may be generated to provide on-line production statistics.

HARMONIC DRIVE DIVISION
51 Armory Street
Wakefield, MA 01880
Tel: 617/245-7802
Telex: 94-9442
Contact Person: Jeffry D. Stoehr
Marketing & Sales Manager

Powerful, compact high ratio gearing products widely used in robot actuators. These gear systems offer high precision for accuracy and repeatability while enabling the robot manufacturer to design actuator systems using far less space and weighing much less than any other gearing system of equal performance.

HONEYWELL VISITRONICS
4800 E. Dry Creek Road
P.O. Box 5077
Englewood, CO 80155
Tel: 305/850-5050
Telex: 4322015HONY UI
Contact Person: Dale Alexander
Marketing Administrator

A full line of Smart Non-Contact Vision Sensors which provide an economical solution to quality control and measurement problems. The sensors can be easily applied to gauging, tracking, measuring, and inspection applications with full communications capabilities.

INDUSTRIAL DEVICES CORPORATION
35 Pamaron Way
Novato, CA
Tel: 415/883-3535
Contact Person: James A. Griffin
President

Industrial Devices Corporation is a leading manufacturer of standard electromechanical linear actuators and electronic controls to drive them. "Electric Cylinders" provide linear axes for robotic motion in a compact package without pneumatic or hydraulic power. They are available with stepping motors for precise positioning or DC motors for point to point or variable speed operation. All units feature zero backlash ball bearings, precision lead screws with internally guided drive nuts, and totally sealed construction. Standard "off-the-shelf" units operate at speeds up to 10 inches per second and move loads up to 800 lbs.

INFRANOR, INC.
45 Great Hill Road
Naugatuck, CT 06770
Tel: 203/729-8258
Telex: 59-5573
Contact Person: Willard B. Spring
President

Servo motors and servo motor systems with integral brakes, tachometers, encoders, and gearing. Also, servo controls of high frequency, high current PWM rack mount type.

Positioning system components including Mavilor disc armature motors and DC fail-safe brakes.

The Mavilor motor is a low-inertia, permanent magnet DC disc motor with a wound armature of copper magnet wire molded with epoxy resin into a dish shape. The motors range in size from 1/5 to 16 HP and are available with tachometer, brakes, encoder, gear reducers and companion Infranor PWM transistorized servo-amplifiers especially designed to optimize motor performance. The motor's high performance/low inertia make it ideally suited for electric robots.

ITRAN CORPORATION
670 N. Commercial Street
Manchester, NH 03105
Tel: 603/669-6332
Telex: 696 191
Contact Person: John Pemble
Vice President, Sales & Marketing

Itran Corporation is a leader in the field of MACHINE VISION INSPECTION. ITRAN's family of products offers advanced FULL SPECTRUM VISION INSPECTION technology, which means ITRAN systems are Robust, Fast, Flexible and Easy to Use. An ITRAN vision inspection system will help you: improve product quality and increase productivity. These result in greater profits for your company.

ITRAN systems help ensure 100% effective and timely inspections for products in a wide variety of industrial applications, including: automotive; wire, wire harness and connectors; printed circuit boards and hybrid circuit modules; food processing; medical plastics; and more.

In the ITRAN system a computer is used to analyze images it receives from a TV camera. Advanced software enables an ITRAN to inspect parts and to immediately accept a good part or reject a bad part. ITRAN systems combine gray scale technology, edge detection techniques and

correlation techniques to provide systems that are fully practical in today's manufacturing environments.

Among ITRAN's products are the top of the line ITRAN 8000 system, and the lower cost, high performance VIP series. ITRAN's products come with a two (2) year warranty.

JERGENS INC.
19520 Nottingham Road
Cleveland, OH 44110
Tel: 216/486-2100
Contact Person: Brooke Meyer
Product Coordinator

Pick and Place Components:

Grippers—Pneumatic-Scissor and Parallel Action. Proximity and Limit Switch Sensor Options. Handling Capacity from Ultra Light to 4 Kgs.

Slide Assemblies—Pneumatic-Strokes from 15 to 3000 MM. Standard Sliding and Fixed Bases. Stack and Bolt together for X-Y-Z Motions. Limit Switch and Solenoid Valve Options.

Conveyors—Electric-Endless Belt-Belt Widths from 20 to 500 MM. Lengths from 500 to 2000 MM. Fixed or Variable Speed and Reversing. External or In-Line Motors. Belt Material, Mounting and Guide Options.

Pick and Place Units—Pneumatic-90° or 180° Strokes. Handling Capacity from .3 Kg to 3 Kg. Single or Double Arm, Limit Switch and Damper Options.

Escapements—Pneumatic.

KENNAMETAL ERICKSON
34300 Solon RR
Solon, OH 44139
Tel: 216/349-8213
Contact Person: John P. Boggess,
Marketing Manager
Val Ramunas,
Senior Engineer, Robotic Prods.

1) Quick change end of arm tooling for grippers, air driven tools for material finishing operations.
2) End of arm tool storage and hanger devices.
3) Compliant devices with tool load sensors.
4) Special tool designs with custom sensor capabilities.

KEY IMAGE SYSTEMS, INC.
20100 Plummer Street
Chatsworth, CA 91311
Tel: 818/993-1911 Telex: 910-494-2109
Contact Person: Gordon H. Dickson Vice President, Marketing

New ROTAZOOM™, image manipulating camera which is software controlled via an S-232 port to provide precise electronic rotation of the viewed field in 1024 increments thru 360°. The electronic zoom feature provides up to 6:1 magnification of precisely defined coordinate windows within the overall field of view, while not degrading the 512 x 512 pixels resolutions.

The ROTAZOOM™ camera is available either as a "stand-alone" system module or an integral component of Key Image's new INEPC-16 vision system.

KOLLMORGEN INDUSTRIAL DRIVES
201 Rock Road
Radford, VA 24141
Tel: 703/639-2495
Telex: 710-875-3743
Contact Person: Hurley H. Gill, Jr.
Applications Engineer

Kollmorgen Industrial Drives offers you a complete line of motion control products. Our PWM amplifiers and servomotors, in both brush and brushless designs, reflect the most advanced technology now available. Your precision motion control requirements challenge our research and engineering teams to provide you with the optimum performance servo system; one that represents the best VALUE for you. Engineering support is an important part of our product package, too, whether you need a standard or customized product.

A multitude of motor choices allows you to simplify your selection decision. Our motors, with continuous torques from 0.18 to 11 lb.-ft. TENV, provide an array of performance alternatives. We have a broad range of motor configurations including conventional DC brush, DC brushless (AC servo), and variable frequency AC servos. Our servo drives are designed to fully complement all our motors. Employing PWM and SCR technology, our amplifier line includes brush and brushless DC and variable frequency AC with continuous current levels from 6 to 200 amps. Our single-axis controller interfaces with either a DC or AC servo motor system to allow greater motion control.

MACHINE VISION INTERNATIONAL CORPORATION
325 East Eisenhower, Suite 207
Ann Arbor, MI Tel: 313/996-8033
Contact Person: Don Vuchetich
Marketing Manager

ROBOT ACCESSORY (Con't)

A full range of computerized vision systems for industry. Machine Vision International's product line includes the Series 1000 Image Flow Computer,™ the Genesis 2000 Development System™ and the Series 3000 Programmable Sensor Cntroller.™ Each of these systems is capable of performing full gray scale processing with three dimensional robot guidance capabilities by providing coordinate and offset information. These overall capabilities provide an integrated machine vision system for industry applications in the area of assembly, inspection and non-contact gauging.

MADISON ELECTRONICS
28042 Groesbeck Hwy.
Roseville, MI 48066
Tel: 313/778-7640
TWX: 810-226-7047
Contact Person: Max B. Fellsman
General Manager

Madison Electronics is a full-time stocking distributor of Amphenol, Burndy, Edac, Pyle National, and Epic connectors. In addition, our cable assembly division builds custom cable assemblies that range from RS232 computer links to heavy duty industrial usage.

MANCA/AMECO
W158 N9335 Nor-X-Way Avenue
Menomonee Falls, WI 53051
Tel: 414/255-3910
Telex: 6853422
Contact Person: Edmund L. Bella
Vice President, Marketing & Sales

Modular All-Electric Gantry System FLEXIMAG for: 1) Machine Tool Loading/Unloading; 2) Machine Tool Automation/Tool Changing; 3) Work Cell Automation; and 4) Factory Automation with peripheral equipment such as Palleting systems, Non-Synchronized Pallet Conveyor Systems, Friction Roller Conveyors and Workpiece Pallets and Trays.

Front Arm Lathe Loading Systems with Conveyor System for Chuckers.

Special Machine Tool Automation—Designing and Building Special Integrated systems.

MANCA/AMECO specializes in Machine Tool Loading using Gantry Systems with In-House Engineering and Field Installation servicing the OEM Market and End User Market.

MENTOR PRODUCTS, INC.
7785 Mentor Avenue
P.O. Box 330
Mentor, OH 44061-0330
Tel: 216/942-8666
Telex: 6873051 PMUW
Contact Person: Michael Urban
Director of Marketing

— Mobile platforms for robots
— Special conveying automation to bring material to and away from robots
— Automatic Guided Vehicle Systems where no standard design will do with load capacity to 100,000 pounds
— Robotic Press Loading Equipment

MICRON INSTRUMENT CORPORATION
210 Express Street
Plainview, NY 11803
Tel: 516/349-1200
TWX: 510-221-2194
Contact Person: Brian O'Rourke
Sales Engineer

Feedback Transducers with geared or direct coupled resolvers, encoders, or tachometers. Available with multiple components for absolute positioning, with up to 5 programmable limit-switches in the same package. Pulse Generators provide auxiliary positioning controls independent of a programmed control unit. High torque zero-backlash gear boxes and planetary roller-screws.

MILLER EDGE, INC.
Concord Industrial Park
P.O. Box 38
Concordville, PA 19331
Tel: 215/459-4242
Contact Person: Bearge D. Miller
Project Engineer

Miller Edge is a manufacturer of high quality switch-mats for protection of robotic equipment and operators. Appropriately named, the GUARDIAN MAT is a heavy-duty industrial switch-mat which utilizes our unique patented construction to provide a safety-zone for the working envelope of robots.

The GUARDIAN MAT is sensitive to slight foot pressure. FAIL-SAFE 4-wire construction is available to provide optimum protection. Unique Alumaglas® contact sheets are 100% flexible and are rated at 24 volts A.C. or D.C.

GUARDIAN MAT holds up to severe impact loads and heavy tool or die carts typically used in robotic work areas. It has a tough ¼" thick PVC corrugated surface which gives long lasting and dependable

ROBOT ACCESSORY (Con't)

use in severe wear areas. GUARDIAN MAT resists abrasion, cuts, tears, and is acid and stain resistant. It also has excellent chemical resistance to most industrial chemicals except Ketones and Clorinated solvents.

In addition to robotics, GUARDIAN MAT is used in a wide variety of signaling applications for: conveyor systems...metal forming equipment...assembly line signaling...escalator activation...step signaling on mass transit vehicles...door controls and alarm systems.

MONFORTE ROBOTICS, INC.
2333 Whitehorse-Mercerville Road
Trenton, NJ 08619
Tel: 609/586-5094
Contact Person: Mathew L. Monforte
President

FOREMAN™ SERIES: Intelligent, Industrial Robotic, Quick-Change End Effectors. Under pneumatic control, all FOREMAN end-effectors have the capability of working with an endless variety of parts and tools in a single robot work cell. Tool exchange time less than ½ second. Base price cost of $150.00 per tool change. A variety of sensors and features; i.e., non-contact sensing, sensors to verify new tooling acquired, fingertip sensing, collision compliance suspension/sensing, selection of grasping pressures, programmable finger position with feedback, alarm systems, tactile sensing/verification. FOREMAN Hands: 120 lbs. max. of grasping force; weight 2.4-3.2 lbs.; come complete with cables, controllers, mounting. FOREMAN Controllers either I/O or RS232 interface to Host Robot Controllers, and are extremely user friendly. Monforte Robotics Consulting and Robotic Systems—Our staff available to evaluate, design and install partial or turn-key automated and/or robotic systems.

MOOG INC.
East Aurora, NY 14052
Tel: 716/652-2000
Telex: 91-9144 TWX: 710-264-1442
Contact Person: Daniel C. Clark
President, Industrial Controls Group

Moog designs, manufactures, and markets a full line of motion control products, including:

- Intrinsically safe jet-pipe and nozzle-flapper servovalves
- Low friction, long life hydraulic servoactuators
- Dirt fuse filters for totally reliable fluid filtration
- Signal conditioning electronics
- Permanent rare-earth magnet AC (brushless DC) servomotors
- PWM three-phase motor drives
- Multibus compatible microprocessor-based hardware and software to close digital servoloops and interface with host computers and/or programmable motion controllers
- Electronic PCB and other assemblies built and tested to customer design.

Moog subsidiaries are in England, France, Germany, Ireland, Japan, Brazil, Australia, Sweden, Spain, Austria, and Italy.

OBJECT RECOGNITION SYSTEMS, INC.
440 Wall Street
Princeton, NJ 08540
Tel: 609/924-1667
Contact Person: Chris G. Chaggaris
Manager, Public Relations & Advertising

Flexvision System, advanced computerized vision system applicable to factory automation in electronics and industrial markets.

i-lign—for automated visual inspection alignment of screen printing on multiple layer electronic circuit boards.

i-tect—for automated visual flaw-detection in high-quality glass-surface components.

i-tac—for automatic lint "tack-off" on automotive body surfaces prior to assembly line painting.

i-bot—for intelligent vision guidance for robotic bin-picking and automation applications.

i-scan—for automated on-line, in-process visual inspection on high-speed production lines.

OPCON, INC.
720 80th Street, S.W.
Everett, WA 98203
Tel: 206/353-0900
Telex: 152-963
Contact Person: Marc Bothel
Sales Support Manager

Opcon's 20/20 Vision Systems are low cost, low upkeep, high precision progammable machine vision systems. Using a one dimensional CCD array and a powerful microcomputer, the 20/20 Vision Systems can provide intelligence to automate numerous industrial tasks such as gaging and volume calculation, sorting, quality inspection, and positioning. The camera and controller are packaged separately in

ROBOT ACCESSORY (Con't)

aluminum cast housings allowing rugged, flexible and reliable monitoring and control. Standard software is available for common applications or the System may be either factory custom programmed or end user programmed with a FORTH based programming language. Two array size are available, 256 and 1024 photosites, which with enhancement software can give field-of-view resolution of one part in 2000 and one part in 8000 respectively.

The 20/20 Vision System is easily integrated into the industrial control environment as it has 16 separate input and output ports, ranging from high current AC triac switches to TTL logic for programmable controller compatibility The systems permit quick, reliable inspection; typical applications usually allow between 500 to 2000 inspections per minute. Specialized lighting is not required and most applications use ambient factory or off-the-shelf lighting.

PACIFIC SCIENTIFIC
4301 Kishwaukee Street
Rockford, IL 61109
Tel: 815/226-3030
Telex: 386743
Contact Person: Douglas W. Franklin
Marketing Manager, Brushless Motors & Controls

PMDC Motors, Brushless Motors, Brushless Servo Controls, Adjustable Speed Brushless Controls.

PARKER HANNIFIN CORPORATION
17325 Euclid Avenue
Cleveland, OH 44112
Tel: 216/531-3000
Telex: 98-0636
Contact Person: Gilbert J. Bandry
Manager, Manufacturing Systems

Parker Hannifin Corporation is the world's leading supplier of fluid power products—hydraulic and pneumatic components and systems—for the industrial, automotive, aviation, space and marine markets.

Parker continues its unique competitive edge: No single company in the world directly parallels its broad product offering, although there is active competition by product line. Over 500 industries make use of the 100,000 catalog items in the 320 product lines manufactured by the Company's 68 Divisions.

Supporting these Divisions are the sales and service organizations where more than 200,000 customer outlets depend on 1,076 direct sales people and about 18,400 distributors, distribution outlets, jobbers, retailers and wholesalers to meet their daily product, engineering and service needs.

These global needs are met by a global company. Worldwide, over 22,000 employees staff 129 manufacturing plants, 51 administrative and sales offices and 51 product and service distribution centers.

Parker's products are about three-fourths standard off-the-shelf items and one-fourth custom engineered. Sales are about equally divided between original equipment manufacturers (OEM) and maintenance, repair and overhaul (MRO).

PATTERN PROCESSING TECHNOLOGIES, INC.
511 Eleventh Avenue South
Minneapolis, MN 55415
Tel: 612/339-8488
Contact Person: Paul Kraska
Public Relations

Pattern Processing Technologies, Inc. (PPT), founded in 1981, designs, manufactures and markets instruments and systems which recognize patterns in sensory information. PPT products feature a new innovative "adaptive hardware" approach in the recognition process which solves the three major problems inherent in traditional software based pattern recognition products: slow response times, extensive programming and inflexibility. PPT's first products are machine vision instruments and systems built using the adaptive hardware architecture of the Associative Pattern Processor (APP). All APP based products are supported by PPT's System Consulting Services (SCS). PPT's machine vision products feature a modular design with high speed operation hierarchical testing using 1020 windows, 100 tests and 20 different procedures, 16 cameras operation, a frame splitting capability, parallel camera processing and strobing.

PEGASUS AMCA INTERNATIONAL
2890 John R. Road
Troy, MI 48083
Tel: 313/689-9000
Telex: 810-232-1529
Contact Person: Andrew Novallo
Applications & Representative Sales Manager

ROBOT ACCESSORY (Con't)

Electro Hydraulic Servo Valves, Fatigue Rated Linear Actuators w/LVDT's, Hydraulic Accessory Modules, Modular Electronic Controls, Electropneumatic Servo Valves, Computer Test Controllers, Engineered Test Systems, Fatigue Test Systems, Structural Test Systems.

PENN VIDEO
929 Sweitzer Avenue
Akron, OH 44311
Tel: 216/762-4840
Telex: 48-6327 PVI-AKR
Contact Person: Gary Wagner
Vice President of Marketing

Penn Video designs and manufactures Machine Vision and Automatic Real-Time X-ray Inspection Systems configured for 100% on-line assurance of manufacturing uniformity.

MACHINE VISION: Our Machine Vision systems can automatically inspect, measure, identify, sort and orient your parts at production line speeds. Results of the image analysis can be used to automatically reject part failing inspection criteria or to control a flexible manufacturing process. VIDOMET® II, our custom-expandable vision systems, and FORESIGHT,™ our stand-alone machine vision module, are both application-configurable. User-friendly takes on a new meaning with the standard software package in VIDOMET® II and FORESIGHT.™ Both systems are completely preprogrammed at the Penn Video factory. As a result, we can choose the optimal image processing solution to your problem from our vast software library. Binary image processing, gray scale feature analysis, pattern recognition, measurement and windowing are all available techniques.

AUTOMATIC X-RAY: Penn Video has combined real-time x-ray imaging and machine vision technology, permitting automatic internal defect detection on-line with no operator assistance. Automatic x-ray replaces a subjective inspectors judgement with a consistent computer decision.

PEPPERL+FUCHS, INC.
32111 Aurora Road
Solon, OH 44139
Tel: 216/349-0488
Contact Person: Greg Ernst
National Sales Manager

Pepperl+Fuchs manufactures a complete line of inductive, capacitive, and ultrasonic proximity sensors. The sensors are available in many configurations and can be used in a variety of applications. We specialize in applications where speed, reliability, and high switching accuracy are essential.

Pepperl+Fuchs also manufactures Intrinsically Safe switching amplifiers as well as speed monitors, D/A converters, logic functions, timers, and temperature controls.

In addition, we offer encoders, counters, Zener Barriers, and multiplexer systems.

PERCEPTRON, INC.
23855 Research Drive
Farmington Hills, MI 48024
Tel: 313/478-7710
Telex: 556521
Contact Person: Gregory H. Knudson
Manager, Marketing Services

The MV-300 noncontact measurement/process control system for instantaneous feedback of statistical process data in production facilities. The MV-600 noncontact visual fixturing systems for robot guidance.

PHD INC.
P.O. Box 9070
Fort Wayne, IN 46899
Tel: 219/742-6151
Telex: 23-2611
Contact Person: Don Wood
Vice President, Marketing

PHD Inc. manufactures a complete line of air or hydraulic modular automation components. Included are linear actuators, rotary actuators, combination rotary and linear devices, two axis linear devices, grippers and sensors. These units can be used as stand-alone units or combined together to build pick-and-place, assembly, load/unload and transfer type devices.

PHD grippers and rotary actuators are used as end effectors for many industrial robots or automation type of machinery. They are available with proximity switches or sensors for feedback to programmable controllers.

PITTMAN
A Div. of Penn Eng. & Mfg. Corp.
P.O. Box 3
Harleysville, PA 19438-0003
Tel: 215/256-6601
TWX: 510-661-8696
Contact Person: Charles A. Pittman, III
Vice President, Sales and Marketing

Pittman manufactures high performance ELCOM™ rare earth permanent magnet rotor, brushless DC servo motors which offer exceptional torque to inertia and torque to volume ratios.

ROBOT ACCESSORY (Con't)

Pittman also makes a broad range of small brush-commutated DC servo motors.

Spur or planetary gear reducers are available for most motors. Optional optical encoders facilitate use with digital control systems.

PMI MOTORS, INC.
5 Aerial Way
Syosset, NY 11791
Tel: 516/938-8000
Telex: 510-221-1875
Contact Person: Don Wismann
Technical Communications

PMI Motors, Inc., Syosset, NY, is a manufacturer of motion control components such as the ServoDisc™ and SynchroStep™ motors, ServoDisc™ gearmotors, optical encoders and PWM four quadrant amplifiers. PMI ServoDisc™ motors are available from 1/30 hp to 10 hp. The motors operate a stall to 3000 rpm with zero cogging, have compact axial lengths and high torque to weight ratios.

SynchroStep™ (step) motors using a samarium colbalt disc rotor have up to 7 times the acceleration of conventional step motors and 1/10 the inertia.

Optical encoders are available in kit form and in industrial housing with resolutions to 2540 lines per revolution.

ServoDisc™ gearmotors with output torques to 2414 in./lbs. and 5 min. of backlash max. are available as a complete actuator package, gearmotor/analog tachometer/optical encoder/fail-safe brake.

PMI also supplies PWM (Pulse-Width Modulated) four quadrant amplifiers; single axis with power supply, multi-axis with power supply and compact modular amplifiers and power supplies.

PMI Motors produces motion control components for almost any precise incremental or continuous motion application. PMI's Applications Engineering Department is available to provide assistance with most motion control applications.

POLY-SCIENTIFIC/LITTON
FIBER OPTIC PRODUCTS
DIVISION
1213 North Main Street
Blacksburg, VA 24060
Tel: 703/552-3011
TWX: 710-875-3694
Contact Person: Rebecca J. Savage
Marketing Co-ordinator

Fiber optic communication systems—point to point RS232 and LAN. Fiber optic components including transmitters, receivers, wavelength division multiplexers and fiber optic rotary joints. Rotary electrical joints—slip rings and limited rotation polytwist devices.

Other products that we produce are slip ring assemblies and limited polytwist devices.

PULNIX AMERICA, INC.
770-A Lucerne Drive
Sunnyvale, CA 94086
Tel: 408/733-1560
Contact Person: Mary K. Pomeroy
Sales Manager, Video Components

PULNiX manufactures a line of miniature CCD camera and accessories used in vision systems, robotics, and automated inspection systems. These cameras are high resolution, compact, lightweight, and are available in color and black and white.

RANK VIDEOMETRIX, INC.
5321 Sterling Center Drive
Westlake Village, CA 91361
Tel: 818/707-0423
Contact Person: Lauren Lackey
Marketing Manager

Automatic Video Inspection systems including precision metrology and flaw detection. Measuring range is from 4" to 30" in size with accuracy range from .000010" to .0001".

Also, Rank Videometrix manufactures image processing electronics for use in factory automation applications which include robot inspection stations and other industrial inspection applications.

ROBOHAND, INC.
57 Hamilton Avenue
Waterbury, CT 06702
Tel: 203/374-6063
Contact Person: Nicky Borcea
President

Full line of Robot Grippers—Angular and Parallel Motion, Part Presence Sensorized Gripper, 100% Quality Control Grippers capable of measuring a part within .001". Ultra Thin Rotary Actuators—The smallest on the market. The Power Slide. Revolutionary space saver design with built in air cylinder.

ROBOTIC VISION SYSTEMS, INC.
425 Rabro Drive East
Hauppauge, NY 11788
Tel: 516/273-9700
Telex: 383270
Contact Person: Paul D. Baker
Business Development

BUSINESS: RVSI is primarily engaged in the design and integration of 3-D vision-guided turnkey robotic systems.

PRODUCTS: RVSI's core product line is the ROBO SENSOR® Series, a variety of factory proven 3-D, non-contact vision systems available in a range of configurations to suit specific application requirements.

SYSTEMS: ROBO WELDER,® a 3-D vision-guided robotic welding system offering adaptive fill capabilities, simple, robot-level programming, and software for detection of virtually every seam type. ROBO INSPECTOR,® an accurate, highly flexible, readily reprogrammable (menu-driven) 3-D non-contact optical gauging system. ROBO LOCATOR,® 3-D part location for a variety of robotic applications including assembly and sealant/adhesive dispensing.

ROBOTICS: RVSI has developed turnkey systems employing most of them major industrial robots. Customers may either specify a particular robot, or allow RVSI to select the robot best suited for the application.

SCIENTIFIC TECHNOLOGY INCORPORATED
1201 San Antonio Road
Mountain View, CA 94043
Tel: 800/221-7060
(In CA—415/965-0910)
Telex: 345506
Contact Person: James A. Lazzara
Field Sales Manager

Scientific Technology Incorporated (STI), Mountain View, CA, manufactures a broad range of photoelectric controls and programmable safety light curtains for robot applications. STI's Programmable Safety Light Curtains, the OPTOSAFE,™ is available in heights from 6 inches up to 4 feet. Two versions are offered: the P4000 has a range of up to 25 feet while the PL4000 has an extended range up to 75 feet. The OPTOSAFE™ is designed to OSHA specifications. STI's fiber-optic controls, the FIBERLENS,™ is available as both remote and self-contained systems with a variety of up to twenty different fiber optic probes.

STI's Optical Limit Switch, the UNSIENS,™ Model 309V, is a completely self-contained line operated, solid-state control ideal for programmable controller interface and designed with no internal connectors reducing the problems in wash down and high vibration environments.

For more information, please call STI at 800/221-7060.

SI HANDLING SYSTEMS INC.
Kesslersville Road
Easton, PA 18042
Telex: 847483
Contact Person: Seth R. Schneible
Director, Marketing Services

Manufacture CARTRAC® material transport systems for high speed high-accuracy interface with robotic work stations. CARTRAC systems are modular for ease of installation and repositioning. Precision stations allow positioning repeatability of plus or minus .005" (0.13 mm). Random movement throughout the system allows maximum flexibility while constant tracking is maintained for complete control of "work in progress" throughout the system. Controlled acceleration/deceleration assures safe transport and delivery of parts to and from robotic or manual work stations.

SIMPLIMATIC ENGINEERING COMPANY (SECO)
P.O. Box 11709
Lynchburg, VA 24506
Tel: 804/239-9201
Telex: 82-9408
Contact Person: Donald H. Dimmick
Vice President of Sales and Marketing

Simplimatic Engineering Company (SECO), of Lynchburg, VA, custom designs and builds conveyors and other parts handling systems to transport and control a wide variety of parts on production lines utilizing robots.

Equipment includes table top and multiflex conveyors, feeding and orienting devices, elevators and lowerators, bi-directional accumulation tables, combiners and dividers, pallet handling systems and pallet dispensers and stackers. The company also manufactures programmable electrical controls and specializes in total systems responsibility.

ROBOT ACCESSORY (Con't)

SMC PENUMATICS, INC.
P.O. Box 41199
5538 West Raymond Street
Indianapolis, IN 46241
Tel: 317/247-1523
Telex: 27-2184
Contact Person: Timothy Zaccard
Assistant National Sales Manager

Directional Control Valves (10/32 through 1" NPT), Series NVS Direct Solenoid Operated Air Valves, Series NVSA Air Pilot Operated Air Valves, Series NVSP Solenoid Controlled/Pilot Operated Air Valves, Mechanical Air Valves, Subplate Mounted Hand Valves, Speed Control Valves, Rotary Sealed Hand Valves, Mechanically Actuated/Pilot Operated Valves, Mechanical Valves, Check Valves, Quick Exhaust Valves, Filters-Regulators-Lubricators, 10/32 through 2" NPT, General Industrial Type, Industrial Type, Air Dryers, Actuators, Cylinders—Pneumatic, Cylinder Positioners, Rotary Actuators, Controllers/Instrumentation, Electro-Pneumatic Positioner, Electro-Pneumatic Transducer, Pneumatic-Pneumatic Positioner, Cylinder Positioner, 8-Step Sequencer, 50-Step Programmable Sequencer, Pneumatic Proportional Valve, Other Products, Silencers/Mufflers, Fittings, Air-Hydro Unit.

SUMTAK ELECTRONIC INSTRUMENTS/DAIDO CORPORATION
885 Centennial Avenue
Piscataway, NJ 08854
Tel: 201/885-1700
Telex: 219986
Contact Person: Robert J. DeCroce
Sales Representative

Sumtak Electronic Instruments is a manufacturer of rotary optical encoders and related electronic motion control devices. Our encoders include both incremental and absolute. They are available with line counts up to and including 5000 PPR, with various output signal types including line driver.

Primarily designed for harsh environments, both our shaft and modular encoders are capable of withstanding extreme conditions in the following areas; shock, vibration, temperature, and humidity. Each encoder's electronics are designed around a hybrid integrated circuit that compensates for; intensity of LED over time, temperature variation, and vibration. Comprehensive testing and assembly procedures in our factories assure the performance of the encoders prior to shipment to our customers.

Additional products manufactured include a CNC Controller, Programmable Cam Controller, digital tachometers, and high frequency rotary pulser.

SYSTEM CONTROLS, INC.
P.O. Box 12007
Birmingham, AL 35202
Tel: 205/591-8655
Contact Person: John W. Ramsay
President

System Controls, Inc. is an engineered systems house providing custom designed and manufactured electrical control systems for industrial, municipal and commercial applications.

TELEDYNE GURLEY
514 Fulton Street
Troy, NY 12181
Tel: 518/272-6300
Telex: 710-443-8156
Contact Person: Gerald S. Gordon
Sales Manager

Teledyne Gurley has maintained continuous leadership in optical encoder technology for over 30 years. We manufacture a complete line of rotary and linear optical encoders for the precise measurement of position and speed. Our self-contained rotary encoders are available in 5 different sizes from 1.1" diameter to 3.5" diameter, and can provide almost any resolution from under 100 to over 400,000 pulses per revolution. Modular rotary encoders can be used for special large-diameter applications up to 3' diameter. Linear encoders are available in both open and closed models, in lengths up to 80", and with resolution from .002" to .00002". In addition, we provide custom-designed encoders to meet ultra-precision requirements in the most severe industrial, military and space environments. Detailed publications which describe our optical encoder products and capabilities are available upon request.

THOMSON INDUSTRIES, INC.
Shore Road & Channel Drive
Port Washington, NY 11050
Tel: 516/883-8000
Telex: 685 2347
Contact Person: Leonard S. Napolitano
Manager, Marketing Services

Thomson Industries, Inc., invented and is the world's largest manufacturer of precision anti-friction linear bearing sys-

ROBOT ACCESSORY (Con't)

tems. Forty years of linear motion product development has produced a continuous flow of patented designs for use in all manufacturing industries. Products include linear ball bearings from ⅛ inch diameter to 4 inch diameter; linear roller bearings with load capacity up to 35 tons per bearing; a self-aligning linear ball bearing with 3 times greater load capacity than conventional linear ball bearings—equivalent to 27 times longer travel life; precision hardened-and-ground steel shafting; ready-to-install linear motion tables and slides; and an extra-rigid machine tool/robotic linear bearing system.

All Thomson linear motion products provide smooth, accurate movement at steady state speeds up to 4000 inches per minute with little or no lubrication required. Products are available off the shelf from over 950 distributor branches worldwide. Application and design assistance is available through 10 Thomson Regional Managers and an expert home office staff. To find out the name and number of the Thomson distributor or Regional Manager in your area, call toll-free 1-800-645-9357.

THE TIMKEN COMPANY
1835 Dueber Avenue, S.W.
Canton, OH 44706
Tel: 216/438-4119
Contact Person: A. Thomas Gorman
Manager, Process Eqpt. Mkts., Industrial Division

LOAD CAPABILITY—Can carry radial and thrust loads or any combination.

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TECHNICAL ASSISTANCE—Bearing application engineering assistance available worldwide from The Timken Company.

VEEDER-ROOT COMPANY
70 Sargeant Street
Hartford, CT 06102
Tel: 203/527-7201
Telex: 99219
Contact Person: William Kavanagh
Director, Product Marketing

Programmable Controllers, Proximity Switches, Ultra-Precision Switches, Photo-Electronic Controls, Electronic Predetermining Counters, Electronic Totalizers.

VIEW ENGINEERING, INC.
1650 N. Voyager Avenue
Simi Valley, CA 93063
Tel: 805/522-8439
Telex: 182-304
Contact Person: Andrea Berry
Communications Coordinator

The VIEW-1200 is an automatic non-contact 3-dimensional measurement system. The VIEW-1119 is used for high-speed part identification, alignment, robot guidance and inspection. The VIEW-719 is the first on-line, non-contact, dimensional measurement inspection system. The VIEW-1101 is a high-speed pattern matching system for robot guidance and part identification. It can search through 360 degrees of rotation, to identify a part or pattern at any orientation. The VIEW PR-1 is the first pattern matching robot guidance system. It uses correlation technology to find a part or pattern, and determine its orientation.

VISION SYSTEM TECHNOLOGIES
WELDOTRON CORPORATION
1532 So. Washington Avenue
Piscataway, NJ
Tel: 201/752-6700
Telex: 219804
Contact Person: J. V. Carlton, Jr.
Division Manager

The Safety & Automation Systems Division markets personnel protection devices (Safe-T-Lite) and Vision Systems (Hawk MWV2000).

Weldotron's Hawk MWV2000 is a user friendly multi-window vision system. Featuring up to 99 programmable windows, it is one of the most flexible vision systems on the market.

Weldotron's Safe-T-Lite is an infra-red light barrier which is a cost-effctive solution to robot work area guarding. The invisible curtain of light forms a safe barrier between the robot and personnel.

ROBOT ACCESSORY (Con't)

WESTAMP, INC.
1542 15th Street
Santa Monica, CA 90404
Tel: 213/393-0401
Telex: 3720078
Contact Person: Michael Mula
Sales Manager

Westamp is an engineering and manufacturing company specializing in the development and production of power servo amplifiers. Westamp was founded in 1957 and incorporated in 1958. The first products were subminiature airborne amplifiers. The product offerings have grown to include a wide power range of Linear, SCR and PWM (Pulse-Width Modulated) Servo Amplifiers. The newest product offerings are PWM Amplifiers for the control of DC brushless motors, ranging in power from 2 kW to 17 kW continuous output ability. A wide selection on DC and DC brushless motors are also available.

Sales and application assistance is offered through an exceptional group of manufacturers, representatives, as well as regional sales offices. Standard products are generally available "off the shelf" from a national organization of distributors who can assist you in the selection, as well as supply your servo system requirements.

ZYGO CORPORATION
Laurel Brook Road
Middlefield, CT 06455
Tel: 203/347-8506
Telex: 64-3006
Contact Person: Kenneth W. Wendt
Product Manager

The Laser Telemetric System product line uses a scanning laser beam to provide very precise non-contact diameter measurements. These instruments are ideally suited for measuring parts which are hot, soft, moving, vibrating, or radioactive. They are often used as stand-alone instruments to measure and sort a large number of parts or they can be placed on-line in production to measure, evaluate, and control the manufacturing process.

Zygo's LTS products range from low-cost, self-contained bench top units which provide important measurement statistics to products which measure parts up to 18 inches in size and can be computer controlled.

Zygo has also designed several shaft measuring systems capable of precisely measuring a variety of dimensions at different locations along a machined shaft. These systems provide an automated time-saving method of checking and measuring the diameter, straightness, taper, roundness, and total indicated runout (TIR).

SYSTEMS SUPPLIERS

AMS/ENGINEERING GROUP
110 Technology Parkway
Norcross, GA 30092
Tel: 404/448-6700
Contact Person: Ronald D. Potter
Vice President

AMS/Engineering Group, as part of the Advanced Manufacturing Systems organization, provides consulting, engineering, and education and training services dealing with the integration of advanced technologies into manufacturing operations. Concept development, design, prototype development and demonstration, project management, and education services are offered. AMS/Engineering Group has one of the largest independent automation laboratories in the U.S., containing various robot types and other automation equipment, such as vision systems, laser gages, etc., for hands-on training and system development.

CMW, Inc., located in Clarksville, Arkansas, as part of the Advanced Manufacturing Systems organization, is a systems integrator specializing in the conception, design, engineering, manufacturing, installation, and commissioning of automated manufacturing systems and robotic equipment. CMW automation systems have been used in aerospace, appliance, brick and block, chemical, defense ordinance, forest products, general manufacturing, graphite products, and petroleum equipment industries.

AMERICAN TECHNOLOGIES, INC.
One Pearl Court
Allendale, NJ 07401
Tel: 201/934-9200
Telex: 426993
Contact Person: Jeanne Mara,
Sales Administrator
Tony Roberts, Manager,
Sales Support

AMERICAN TECHNOLOGIES, INC., is an outgrowth of the Automated Factory Systems and the Industrial Data Systems Divisions of the American Can Company. A company traditionally respected in the industrial world and internationally recognized for pioneering the application of the latest automation technologies to manufac-

turing and marking processes. A highly experienced engineering-based organization geared towards the design, fabrication and installation of turnkey automated factory systems. These systems, ranging in size from single flexible cells to full-fledged complete operations, are utilized to automate product and material handling, assembly, inspection, packaging, fabrication and warehousing applications. A typical system supplied by American Technologies could include automated material handling equipment, industrial robots, production machines integrated with input/output sensors, programmable controllers, vision equipment, factory management computer system and controls, conveyors, and computerized ink-jet printers. The "A.T. Team", a true systems integrator, is committed to working closely with you to assume full responsibilities for the concepting, design, sourcing and installation of the complete system with all mechanical and electrical components accurately integrated and tested.

AUTOMATED ASSEMBLIES CORPORATION
25 School Street
Clinton, MA 01510
Tel: 368-8914
Telex: 710-347-1956
Contact Person: Dan L. Konrad
General Sales Manager

Recognized leaders in automated parts removal for injection molding and in precision assembly operations, Automated Assemblies Corporation is the exclusive North American distributor of Sailor robots specifically designed for injection molded parts removal. AAC is the New England distributor of Seiko robots, and a Value Added Remarketer for IBM robots, both of which are utilized in flexible automation systems for assembly operations. In addition, AAC is the manufacturer of Moldmate robots for injection molded parts removal.

GULF+WESTERN ADVANCED DEVELOPMENT AND ENGINEERING CENTER
101 S. Chester Road
Swarthmore, PA 19081
Tel: 215/544-7600
Telex: 834728 G+W RES SWAR
Contact Person: Martin Friedland
Manager, Business Development

Gulf+Western provides engineering, design, manufacturing and installation of flexible automation systems based on production, volume, system complexity, and inspection needs.

Gulf+Western is a Manufacturing Systems Integrator and robot distributor for IBM and a Systems Application Center for Hitachi, in addition to associations with other leading robot manufacturers.

The company specializes in precision robotic assembly of printed circuit boards, electro/mechanical devices, small motors and military devices.

Gulf+Western offers the following services: Feasibility/Project Analysis; Economic Justification; System Component Selection and Design; Software Selection and Design; Design and Construction of Robotic and Material Handling Systems; Installation and Supervision; Programmer, Operator and Service Training; Long-Term Maintenance Support.

INTERNATIONAL ROBOTIC SYSTEMS, INC.
6119 East Broad Street
Columbus, OH 43213
Tel: 614/863-1051
Telex: 810-482-1732
Contact Person: Mel Kosanchick
President

International Robotic Systems, Inc. provides turnkey systems integration services. The company has advanced state of the art expertise in the area of programmable parts feeding and parts material handling.

International Robotic Systems, Inc. has developed cost effective parts feeding, inspection, and orientation systems for a variety of industrial needs.

NATIONAL ROBOTICS, INC.
6 Mill Race
Spring House, PA 19477
Tel: 215/865-6161 or 215/646-8686
Contact Person: James H. Smith, President
John Keller, Admin. Assistant

NATIONAL ROBOTICS provides flexible automation systems composed of: 1) robot systems, 2) tooling, 3) sensor systems (including machine vision), 4) material handling systems, 5) computers for both cell control and data monitoring and reporting, 6) special auxilliary equipment, 7) application software, 8) programmable controllers and other types of workstation control. Primary user projects are in lighter payloads, batch production rates. However NATIONAL ROBOTICS has also assisted various sized customers to develop their

long term strategy and plan for flexible automation as a consulting function. NATIONAL ROBOTICS does not distribute robots or other related equipment and it is an "independent" systems company.

NATIONAL ROBOTICS will be introducing a proprietary engineering workstation that will assist manufacturing engineers and technicians to integrate their "island of automation" so that they may evolve a cost-effective, working, flexible production line for their company's future.

NATIONAL ROBOTICS maintains a flexible automation staging lab where customer systems are erected, debugged, and where customer personnel are trained. Documentation and post installation warranty is standard and utilizes the optimum vendor services.

PHASE 2 AUTOMATION
3460 West Bayshore
Palo Alto, CA 94303
el: 415/493-5740
Contact Person: Rick Warp
President

Phase 2 Automation provides turnkey factory automation systems for the electronics industry. These systems include integrated robot-based systems. TOTL™ Factory Control provides additional capability to maintain and present to management data on system performance and product quality.

CONSULTANTS

ARTHUR D. LITTLE, INC.
20 Acorn Park
Cambridge, MA 02140
Tel: 617/864-5770
Contact Person: Dr. Gerald J. Michael
Robotics Practice Leader

Arthur D. Little, Inc. provides management and technology consulting services to industry, governments, and institutions throughout the world. As has been its tradition, Arthur D. Little is a pioneer in having a Computer Integrated Manufacturing (CIM) Group assembled to focus on the problems and needs of management as they relate to the "Factory of the Future." Assembled in one group are consultants experienced in the many technical disciplines that permeate the modern computer-based manufacturing environment. Our conceptual framework for computer integrated manufacturing encompasses computer design, group technology, manufacturing planning and control systems, automated materials handling, computer aided manufacturing, robotics, and the computing technology through which these individual technical disciplines are integrated. Our CIM Group has a sound technical grounding and, more importantly, is able to translate highly technical concepts into management terms. In short, our CIM Group has the experience, technical knowledge, and management outlook to address client needs effectively.

ONTARIO ROBOTICS CENTRE
743 Monaghan Road
Peterborough, Ontario K9J 5K2
Canada
Tel: 705/876-1611
Contact Person: Tony Spoore Manager, Client Services

Engineering Services—Including review facilities for automation opportunities, providing conceptual engineering designs and acting as project manager to install automated equipment.

Educational Services—Including three seminars on various topics each month at the Centre and industry or company specific seminars at Client's location.

R. C. REEVE, CONSULTANTS
1131 Hempstead Court
Westerville, OH 43081
Tel: 614/882-1581
Contact Person: Ron Reeve
President

Mr. Reeve is a well known consultant in factory automation and robotics. He has founded: 1) an automation systems company; 2) a robot manufacturing company; and 3) a major technical research institute. He has authored numerous chapters and articles on robotics and automation. Mr. Reeve has distinguished himself in business and finance and is widely respected for his technical contributions. He was SBA Business Person of the Year, is listed in Who's Who, and is fluent in both English and German.

Mr. Reeve personally consults with automation users, robot and automation manufacturers, and emerging high-technology companies. The services provided include: technology audits; resource evaluations; project evaluations; program auditors; business plan development; resource location and contract negotiations.

CONTRACT SERVICES

INTERNATIONAL ROBOTIC
SERVICES, INC.
P.O. Box 3846
Gaithersburg, MD 20878
Tel: 301/258-0311
Contact Person: John Willis Jones
President

Contract Field Support Services for robot and automated system manufacturers, distributors, and system houses. Fully qualified field engineers for installations, maintenance, repair and training support. Warehousing and depot maintenance in geographically convenient locations. Total system support via dedicated or on-call customer engineers.

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President
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